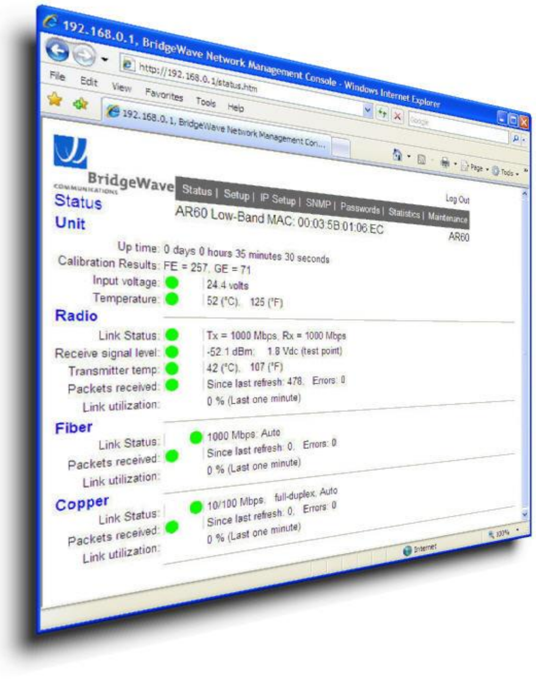
BridgeWave
COMMUNICATIONS

Making connections in a high-speed world

60GHz and 80GHz Wireless Ethernet Links


192.168.0.1, BridgeWave Network Management Console - Windows Internet Explorer
http://192.168.0.1/status.htm
File
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Help
192.168.0.1, BridgeWave Network Management Con...
Page
Tools
Status | Setup | IP Setup | SNMP | Passwords | Statistics | Maintenance
Log Out
Internet
100%

BridgeWave COMMUNICATIONS

Status

AR60 Low-Band MAC: 00:03:5B:01:06:EC

AR60

Unit

Up time:	0 days 0 hours 35 minutes 30 seconds	
Calibration Results:	FE = 257, GE = 71	
Input voltage:	●	24.4 volts
Temperature:	●	52 (°C), 125 (°F)

Radio

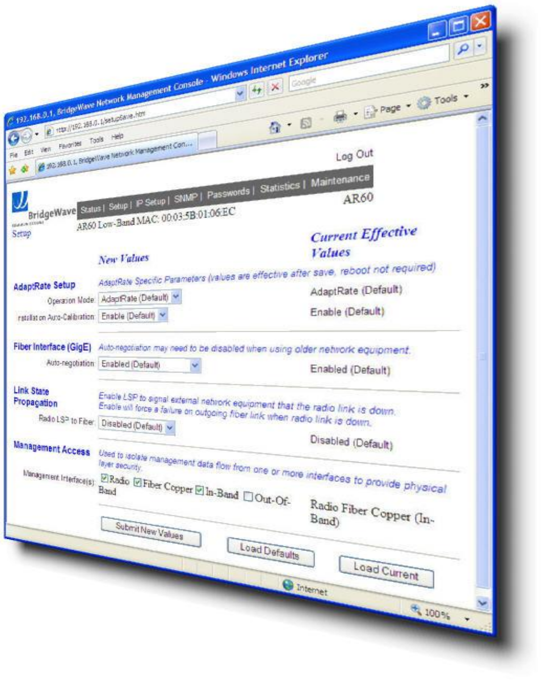
Link Status:	●	Tx = 1000 Mbps, Rx = 1000 Mbps
Receive signal level:	●	-52.1 dBm; 1.8 Vdc (test point)
Transmitter temp:	●	42 (°C), 107 (°F)
Packets received:	●	Since last refresh: 478, Errors: 0
Link utilization:		0 % (Last one minute)

Fiber

Link Status:	●	1000 Mbps; Auto
Packets received:	●	Since last refresh: 0, Errors: 0
Link utilization:		0 % (Last one minute)

Copper

Link Status:	●	10/100 Mbps, full-duplex, Auto
Packets received:	●	Since last refresh: 0, Errors: 0
Link utilization:		0 % (Last one minute)


192.168.0.1, BridgeWave Network Management Console - Windows Internet Explorer
http://192.168.0.1/setupSave.htm
File
Edit
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Favorites
Tools
Help
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Page
Tools
Google
Status | Setup | IP Setup | SNMP | Passwords | Statistics | Maintenance
Log Out
Submit New Values
Load Defaults
Load Current
Internet
100%

BridgeWave

Setup

AR60 Low-Band MAC: 00:03:5B:01:06:EC

AR60

New Values

Current Effective Values

AdaptRate Setup

AdaptRate Specific Parameters (values are effective after save, reboot not required)

Operation Mode: AdaptRate (Default) — AdaptRate (Default)

Installation Auto-Calibration: Enable (Default) — Enable (Default)

Fiber Interface (GigE)

Auto-negotiation may need to be disabled when using older network equipment.

Auto-negotiation: Enabled (Default) — Enabled (Default)

Link State Propagation

Enable LSP to signal external network equipment that the radio link is down. Enable will force a failure on outgoing fiber link when radio link is down.

Radio LSP to Fiber: Disabled (Default) — Disabled (Default)

Management Access

Used to isolate management data flow from one or more interfaces to provide physical layer security.

Management Interface(s): ☑ Radio ☑ Fiber Copper ☑ In-Band ☐ Out-Of-Band — Radio Fiber Copper (In-Band)

NMS Manual

P/N 580-00511
Revision F
January 2008

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Printed in the USA

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This publication has been prepared for professional and properly trained personnel, and the customer assumes full responsibility when using the information herein.

Export Control

All BridgeWave radio products are restricted commodities that fall under ECCN 5A002 of the Department of Commerce. These products are "ENC restricted" under section 740.17(b)(2) of the Export Administration Regulations (EAR). BridgeWave products may only be exported, re-exported, transferred, or retransferred in accordance with Export Administration Regulations. Diversion contrary to U.S. law is expressly prohibited.

Product Compatibility

While every effort has been made to verify operation of this product with many different communications products and networks, BridgeWave makes no claim of compatibility between its products and other vendors' equipment. Customer is responsible for thoroughly evaluating this products performance in the communications environment in which it will be used.

Table of Contents

1 Introduction

1.1 Purpose of Manual

The information in this manual is directed to persons who must perform or coordinate the tasks associated with the process of installing wireless communication devices, and planning communication network applications.

1.2 Prior Knowledge

This manual assumes the operator has at least basic experience with and an understanding of wireless technology and some familiarity with configuring and operating networking equipment. Preferably, the person installing this equipment fully understands the information covered in this manual prior to attempting these procedures.

NOTE and WARNING statements have been placed in various sections throughout this document to alert personnel of possible traffic affecting issues and to provide additional tips and helpful information. These statements should be closely observed.

Symbol	Description
⚠ Warning	*Indicates that serious damage to the equipment, or loss of data can result if the user does not comply with the given instructions. A WARNING statement will describe the potential hazard, its possible consequences, and the steps to perform to avoid serious equipment damage.*
✎ Note	*Provides supplementary information to emphasize a point or procedure, or provides a tip for easier operation.*

1.3 Contact Information

Technical Assistance and Customer Service

BridgeWave distributors and resellers are authorized local service providers and are responsible for immediate Tier 1 customer support. If problems are not resolved, contact BridgeWave Customer Service for assistance:

Location:	Santa Clara, CA USA
E-mail:	support@bridgewave.com
Tech Support Hot Line:	+1.408.567.6906
eService Center:	http://bridgewave.com/support

Return Material Authorization (RMA)

Should BridgeWave equipment have to be returned for repair or replacement, an RMA number must be obtained in advance from BridgeWave or a local BridgeWave distributor. When returning equipment, be sure to write the RMA number on the outside of the shipping carton.

BridgeWave eService Center

You can view knowledgebase content, open a ticket, update tickets and request RMAs on-line 24x7. To view current ticket and RMA status, please go-to http://bridgewave.com/support and select 'eService Center' to login and enter your support portal.
If you need to obtain a log in and password, please send a request to support@bridgewave.com. Include your name, company, email address, and phone number. A support engineer will contact you during normal business hours with your login and password.

BridgeWave Sales

E-mail:	sales@bridgewave.com
Inside Sales:	+1.866.577.6908

2 System Overview

This section provides an overview of the system design.
A BridgeWave link consists of two radio terminals that transmit to each other on a full duplex channel pair, providing point-to-point 100 Mbps or 1000 Mbps Ethernet connectivity between two locations.
BridgeWave products are FDD (Frequency Division Duplex), transmitting on one frequency and receiving on a separate frequency at the same time. One terminal in each link is designated the High-Band unit and one is designated the Low-Band unit. The High Band unit transmits on the higher frequency of the channel pair and receives on the lower frequency, while the Low Band unit transmits on the lower frequency and receives on the higher frequency. Figure 2-1 provides an example of a BridgeWave link.

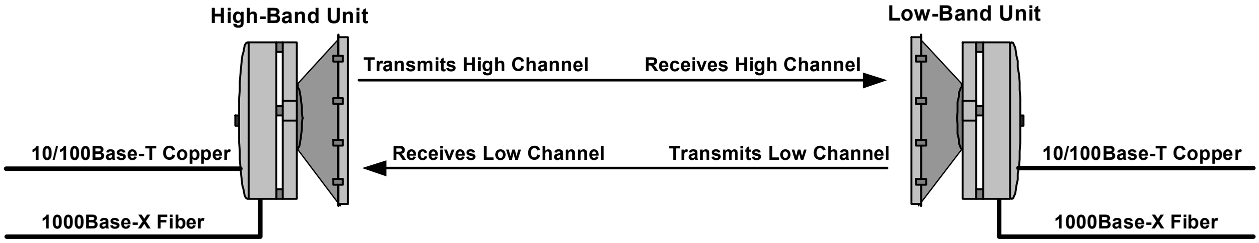


Figure 2-1 Link Diagram

2.1 Internal Switch

Both High-Band and Low-Band units contain an embedded Ethernet switch. The switch has five interfaces and can be configured to allow both user application and management agent Ethernet packets to be delivered to/from the fiber, copper, radio, and or management switch port interfaces. Table 2.1-1 provides a list of the interfaces and a description of each.

Table 2.1-1 Internal Switch Interface List

Interface	#	Description
Loopback	1 (lo)	Internal loopback interface. This interface appears as an interface in SNMP but is not user accessible or configurable.
Management Agent	2 (eth0)	Internal interface that provides a PING responder, an SNMP agent and an HTML web server for managing the unit
Copper	3 (ethCopper)	10/100Base-T copper interface used for out of band management, AdaptPath operation or drop and insert applications. Configured for auto-negotiation enabled and auto-cross-over cable detection.

Fiber	4 (ethFiber)	1000Base-SX (Standard), or 1000Base-LX (Optional) fiber interface. Configurable for auto-negotiation enabled or disabled.
Radio	5 (ethRadio)	This interface is internally attached to the radio transmit and receive channel and provides the connection between the local and remote radio terminals. The interface operates in the following modes depending on product. 100 Mbps (FE Products) 1000 Mbps (GE Products) 100/1000 Mbps (AR Products)

3 Connecting to the NMS

By default the units are configured for ‘In-Band’ management and the web interface can be accessed through the copper, fiber, or over the link via the radio interface.

The units are shipped with the factory default IP address set to 192.168.0.1 for Low-Band units and 192.168.0.2 for High-Band units.

Note	*Multiple users may concurrently access the radio management agent from different browser windows. If multiple users are logged on as Administrator, they are all permitted to independently modify the unit’s configuration.*

The following steps should be followed to connect to the units when in their default configuration state:

1. Configure your PCs IP Address to one that falls within the (192.168.0.3 – 192.168.0.254, Subnet Mask 255.255.255.0) range.

2. Open a web browser and enter http://192.168.0.1 for Low-Band units or http://192.168.0.2 for High-Band.

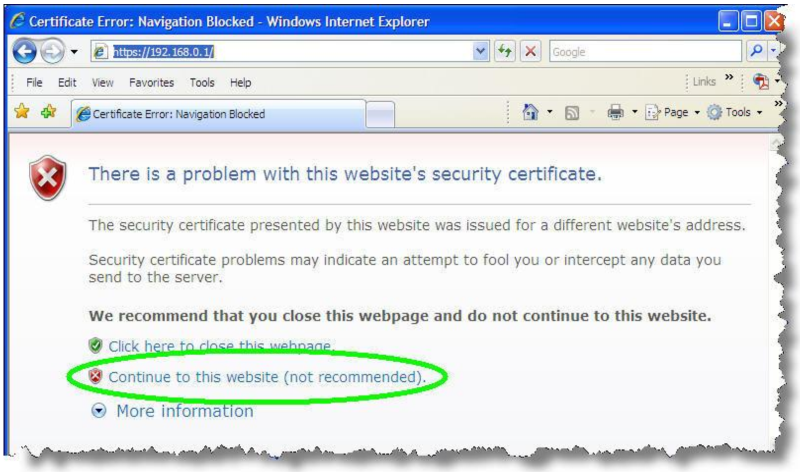
3. For product model numbers that contain the “-AES” designation enter https://192.268.0.1 for Low-Band units or https://192.168.0.2 for High-Band. The https:// URL is required to establish a Secure Socket Layer (SSL) connection to the units.

4. SSL can also be purchased as a standalone feature for use on non-AES systems.

Note	*The units do NOT redirect an http:// entry to the SSL connection.*

Note

Depending on web browser version used, a certificate acceptance dialog window may be displayed when logging into an "-AES" enabled product that requires https:// for establishing an SSL connection. Select the option that allows you to continue to the site.


Certificate Error: Navigation Blocked - Windows Internet Explorer
https://192.168.0.1/
Google
File Edit View Favorites Tools Help
Links
Certificate Error: Navigation Blocked
Page
Tools

There is a problem with this website's security certificate.

The security certificate presented by this website was issued for a different website's address.

Security certificate problems may indicate an attempt to fool you or intercept any data you send to the server.

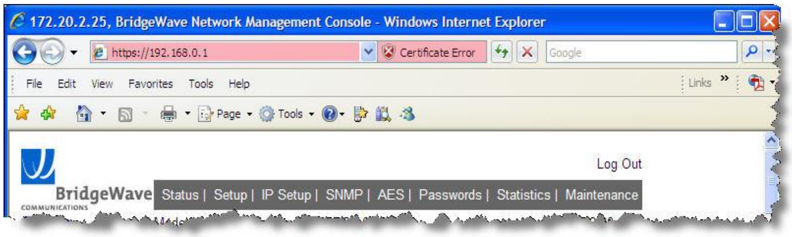
We recommend that you close this webpage and do not continue to this website.

Click here to close this webpage.

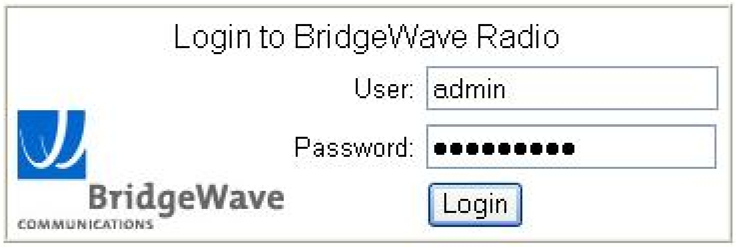
Continue to this website (not recommended).

More information

Some web browser versions will continue to highlight the address bar in red after choosing to continue.


172.20.2.25, BridgeWave Network Management Console - Windows Internet Explorer
https://192.168.0.1
Certificate Error
Google
File Edit View Favorites Tools Help
Links
Page
Tools
Log Out
BridgeWave COMMUNICATIONS
Status | Setup | IP Setup | SNMP | AES | Passwords | Statistics | Maintenance

5. After entering the IP address of the radio unit, the browser should display the logon screen; enter 'admin' as the user and 'adminpass' as the default password.



Login to BridgeWave Radio

User: admin

Password: ●●●●●●●●●

After logging on, the ‘Status’ screen will be displayed. The navigation bar across the top of the screen provides links to the following management functions:

Status – Displays status indications and modes of operation for the units’ interfaces.

Setup – Configure physical network interface settings and access options for the management agent.

IP Setup – Configure DHCP or static IP addressing for the management interface.

AES – Configure and activate 256 key, enable/disable AES on AES equipped units.

SNMP – Configure MIB-2 system group variables and trap settings.

Security – Set/change passwords, enable/disable factory access, and configure SNMP read/write community strings.

Default username/passwords are:

- User Account: user/userpass
- Administrator Account: admin/adminpass

RADIUS – Configure RADUIS server IP, shared secret, timeout and authorization.

Statistics – Display Ethernet traffic statistics for physical port interfaces.

Syslog – Display, filter and clear local Syslog events.

Maintenance – Provides an inventory of hardware and software. Perform an auto-calibration and soft/hard restart. Backup and restore configuration files and update software.

Logout – Terminates the management session from the browser window.

4 Installation Configuration

The initial installation of the units involves configuring AdaptRate options (FE80U, FE60U and AR products only), fiber interface speed and duplex settings, selecting In-Band or Out-Band management options and setting IP addresses. The wireless link should be physically installed following the instructions found in the corresponding installation manual provided with the link. BridgeWave has verified operation with current versions of Windows Internet Explorer and Mozilla Firefox.

4.1 Auto-Calibration

The Auto-Calibrate function is an important part of the system installation and is normally performed during the physical hardware installation, per the procedures outlined in the hardware Installation and Operations Manual, after the antenna alignment has been completed. While this function is normally performed as part of the hardware installation, it is also possible to initiate the function through the web management interface.

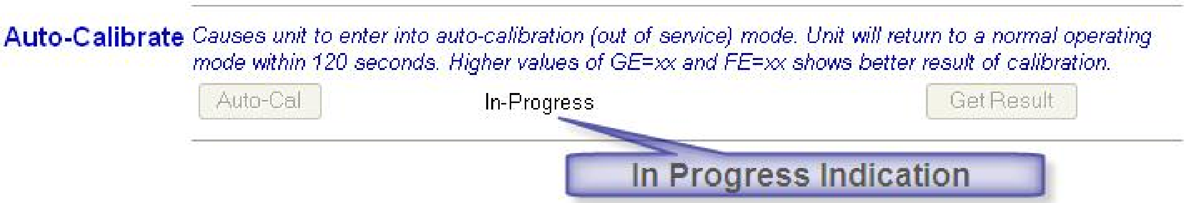
The Auto Calibration feature scans the receive signal level across the entire band and flattens the levels, much like the equalizer on your home or car stereo. The radio system is said to be in "Alignment Mode" when it is first powered up with no fiber connected. Once the alignment is completed; the Auto Calibration mode is triggered ON as soon as the fiber cable is connected. You will know the radio terminal has initialized the Auto Calibration when the Link LED is flashing on/off - this lasts for up to 120 seconds. The fiber interface of the radio terminal needs to detect an optical signal of the appropriate wavelength. This requires the fiber optic cables be connected to a 1000Base-SX port on an Ethernet device (switch, router, media converter, etc.) or this can be accomplished with a fiber optic loopback cable by connecting the fiber output of the radio into the fiber input of the radio. The loopback cable should only be connected long enough for auto-calibration to start and should be removed immediately. Auto-calibration is a required step per installation once antenna alignment is completed.

The results are saved to flash for recall upon system hard restart or power-cycle.

Use the following steps to perform an 'Auto-Cal' from the web management interface.

1. Connect to the web management interface of the unit, and select the 'Maintenance' tab.

2. Under the 'Auto-Calibrate' section click on the 'Auto-Cal' button. An 'In-Progress' status will be displayed.



Auto-Calibrate Causes unit to enter into auto-calibration (out of service) mode. Unit will return to a normal operating mode within 120 seconds. Higher values of GE=xx and FE=xx shows better result of calibration.

Warning	*Clicking the 'Auto-Cal' option causes the link to enter an out of service mode and is considered traffic affecting. The link will return to normal operating mode within 120 seconds.*

3. Continue to click the 'Maintenance' tab to refresh the page. The calibration results will be displayed upon completion, and are automatically saved to flash.

The results are a numeric value that is displayed for Gigabit Ethernet (GE), Fast Ethernet (FE), or both GE and FE are displayed for FE-U and AR products. Listed below is a description of the expected results for each mode.

FE = This field displays the calibration results for the Fast Ethernet (FE) mode of operation. A good calibration will result in a value of 10 or higher being displayed. Higher values indicate better calibration results. As values increase, the incremental benefits diminish.

GE = This field displays the calibration results for the Gigabit Ethernet (GE) mode of operation. A good calibration will result in a value of 10 or higher being displayed. Higher values indicate better calibration results. As values increase, the incremental benefits diminish.

Note	*Calibration results that display slightly lower than 10 may be observed on links that are operating near or over the recommended maximum distance.*

Note	*Performing a 'Get Result' from the 'Maintenance Page' will force the unit to pull the current results and display them on the web interface screen. It may be necessary to do this if a calibration is performed using the fiber cable as outlined in the hardware Installation and Operations Manual.*

4.2 AR, GE, FE Rate Setup

The ‘AdaptRate’ option is available on FE80U or FE60U (using GigE trial mode or upon AR upgrade) and AR products only. This feature allows for the link to operate in 1000 Mbps (GE) mode and temporarily switch to 100 Mbps (FE) mode to overcome fading conditions caused by severe rain events. This parameter can also be used to disable the AdaptRate feature and manually force the link to operate in FE or GE mode only.

Use the following steps to configure the radio Interface (FE-U and AR products only):

1. Connect to the web management interface of the ‘High-Band’ unit, and select the ‘Setup’ tab. The Low band radio will follow the settings of the High band radio
2. Under the ‘AdaptRate Setup’ section select the desired ‘Operation Mode’ from the following options:

   AdapRate (Default) – Allows for automatic switching from 1000 Mbps (GE) mode to 100 Mbps (FE) mode when the Receive Signal Level (RSL) drops to –57dBm or below. The link will automatically return to GE mode when the RSL has reached –55dBm or higher.

   1000 Mbps – Selecting this option fixes the link to operate in Gigabit Ethernet (GE) mode only.

   100 Mbps – Selecting this option fixes the link to operate in Fast Ethernet (FE) mode only.

Note	*The ‘AdaptRate’ ‘Operation Mode’ parameter is configured on FE-U and AR High-Band units. The option is a display only parameter on Low-Band Units. Low-Band units derive the operational mode from the High-Band units. FE and GE products are fixed to 100Mbps or 1000 Mbps modes only. This step can be skipped for fixed mode FE and GE products.*

Warning	*An AR or upgraded FE-U product can be used as a spare for an FE or GE unit of the same frequency and band. However, the ‘Operation Mode’ must be manually set to the appropriate mode when used as a spare. This will prevent the unit from adaptively changing modes, which will drop the link causing a network outage.*

3. If the calibration procedure was performed during the hardware installation make sure the ‘Installation Auto-Calibration’ option has been disabled. Refer to Section 4.1 to perform a calibration from the web interface.

4. Select ‘Submit New Values’ at the bottom of the ‘Setup’ page. A red value will be displayed under the Current Effective Values column. Click the ‘Setup’ tab to refresh the browser window until the Current Effective Value is no longer displayed in red.

4.3 Fiber Interface

All BridgeWave 60GHz and 80GHz radios are fitted with a Gigabit Ethernet fiber interface, regardless of whether the radio is operating in FE (100 Mbps) or GE (1000 Mbps) mode over the air. Two options are available for the fiber interface of the radio unit.

- 1000Base-SX option: Designed for 850nm multi-mode fiber.
- 1000Base-LX option: Designed for 1310nm single-mode fiber.

For both options, the only setting that can be changed is to enable or disable auto-negotiation. When auto-negotiation is disabled flow-control is also disabled. The units are set with auto-negotiation enabled as the factory default.

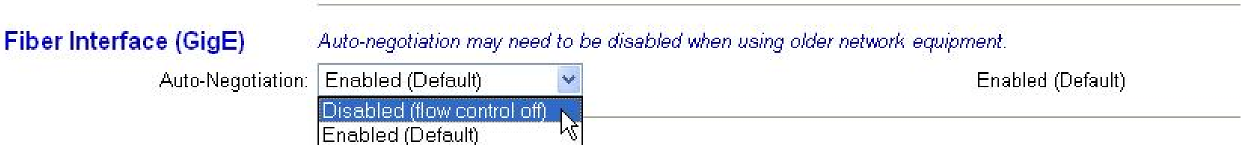
It is important that the BridgeWave radio and the customer network equipment interfaces be configured identically; both interfaces should be configured to auto-negotiate or else both should be configured to not auto-negotiate.

Note	*When auto-negotiation is disabled on the fiber interface, flow-control will also be disabled. If the radio and the network equipment are configured differently, it is likely that a connection will not be established over the fiber or that traffic flows may be impaired.*

Note	*The fiber interface on the radio and the attached switch should be set to auto-negotiate when using the Adapt Rate feature on AR models. This will allow flow control to assert backpressure on the network, via pause frames, when operating in 100 Mbps Fast Ethernet mode. This will assist with preventing congestion and provide for higher Quality of Service (QoS) when stepping from 1000 Mbps down to 100 Mbps mode.*

Use the following steps to configure the Fiber Interface:

1. Connect to the web management interface of the unit, and select the ‘Setup’ tab.
2. Under the ‘Fiber Interface (GigE)’ section, select ‘Enabled (Default)’ or ‘Disabled (flow control off)’.



Fiber Interface (GigE) *Auto-negotiation may need to be disabled when using older network equipment.*

Auto-Negotiation: Enabled (Default) — Enabled (Default)

3. Select ‘Submit New Values’ at the bottom of the ‘Setup’ page. A red value will be displayed under the Current Effective Values column. Click the ‘Setup’ tab to refresh the browser window until the Current Effective Value is no longer displayed in red.

4.4 AdaptPath™ Secondary Path

When an AdaptPath™ link reaches a pre-defined RSL level, the fiber traffic is directed to a secondary path attached to the copper interface such as a 5.4 or 5.8GHz PTP radio link

The Fiber remains operational and In-Band management will still be available.

The AdaptPath™ capability should remain disabled except in redundant link configurations or if it is necessary to quickly signal external network equipment when radio link down states are detected.

The AdaptPath™ feature:

- Is only available in Adapt-Rate (AR) radios from BridgeWave
- RSL activation points are configured from the High band radio in the radio link.
- The Low band radio LSP must be configured as enabled.
- Using the built-in ‘Force LSP’ function on the Maintenance page can test the functionality.

The AdaptPath™ function can be setup to allow:

- GE to FE and then failover by setting the RSL level to the suggested FE default.
- GE to failover by setting the RSL level to the suggested GE default.
- Flexibility to set any RSL level for the AdaptPath™ failover.

The Copper port on the BridgeWave radios is set to Auto-negotiate (AN). The failover radio must also be set to AN. The negotiation between the two devices should settle at 100Base-T Full Duplex.

In-Band management is required, Out-Band management is not available with AdaptPath™ links.

Data over the secondary path is NOT encrypted on AES equipped systems

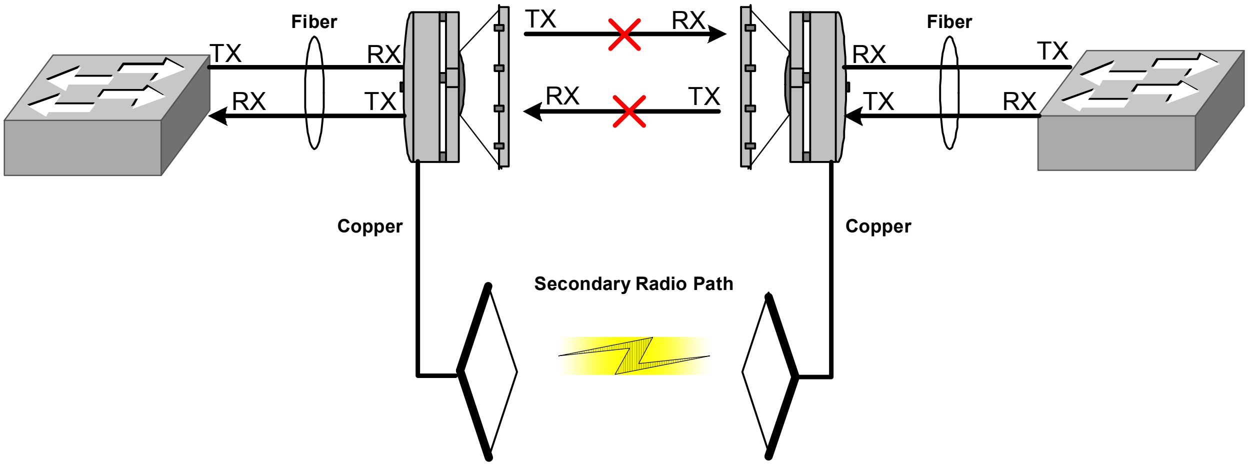
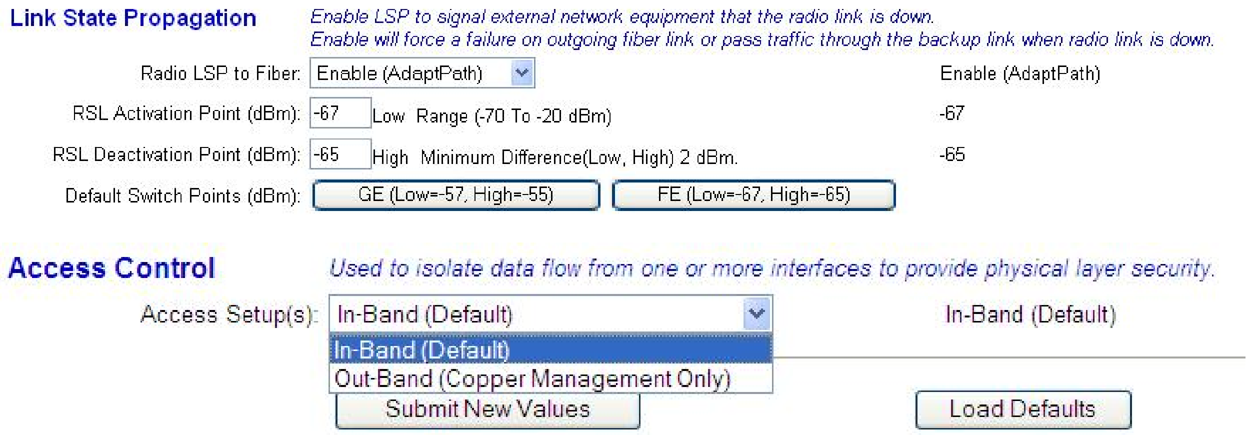


Figure 4-1 AdaptPath™ Technology

Use the following steps to configure the AdaptPath™ feature:

After the equipment is installed, perform the following suggested steps to setup the LSP function in an AR system:

1. In the ‘Setup’ page on both Radios, set the Radio LSP to Fiber selection to ‘Enabled’
2. In the High band radio, press the FE Default Switch Points button to set the RSL trigger points to achieve GE to FE and then to LSP rate switching. The RSL fields will then be filled in with the default values. (The Low band radio RSL Activation function is grayed out)
3. Set the ‘Access Control’ to ‘Out-Band (Copper Management Only)’ at both High and Low band radios
4. Press the ‘Submit New Values’ button at both radios.
5. The High band Radio TX will now be muted, The High Band RX will read green RSL but Red Link. The Low Band RX will read Red RSL and Red Link.



Link State Propagation *Enable LSP to signal external network equipment that the radio link is down.*
Enable will force a failure on outgoing fiber link or pass traffic through the backup link when radio link is down.

Radio LSP to Fiber: Enable (AdaptPath) Enable (AdaptPath)

RSL Activation Point (dBm): -67 Low Range (-70 To -20 dBm) -67

RSL Deactivation Point (dBm): -65 High Minimum Difference(Low, High) 2 dBm. -65

Default Switch Points (dBm):

Access Control *Used to isolate data flow from one or more interfaces to provide physical layer security.*

Access Setup(s): In-Band (Default) In-Band (Default)

Note	***Setting RSL activation point values to zero:*** *When the RSL* ***Activation*** *point is set to zero, the* AdaptPath™ or LSP *function will be continuously forced.* *When the RSL* ***Deactivation*** *point is set to zero, the function will not return after engagement.*

4.5 Synchronous LSP Setup

Link State Propagation (LSP) allows external network equipment to handle redundancy by rapidly switching the application traffic, ***synchronously at both ends of the link,*** to another available (redundant) interface in the external network. This functionality generally supported on enterprise and network backbone class switches and routers.
LSP should remain disabled unless it is necessary to quickly signal external network equipment when radio link down states are detected.

LSP:

- Is available in all radios from BridgeWave, AR, GE, FE and FE-U.
- The functionality can be tested by using a built in test function.

LSP can be setup to allow:

- AR: GE to FE and then LSP by setting the RSL level to the suggested FE default.
- GE: GE to LSP by setting the RSL level to the suggested GE default.
- FE: FE to LSP by setting the RSL level to the suggested FE default.
- Flexibility to set any RSL level for the LSP activation.

In-Band management will be disconnected from Fiber when LSP is activated. In-Band and Out-Band management will still be available from Copper.

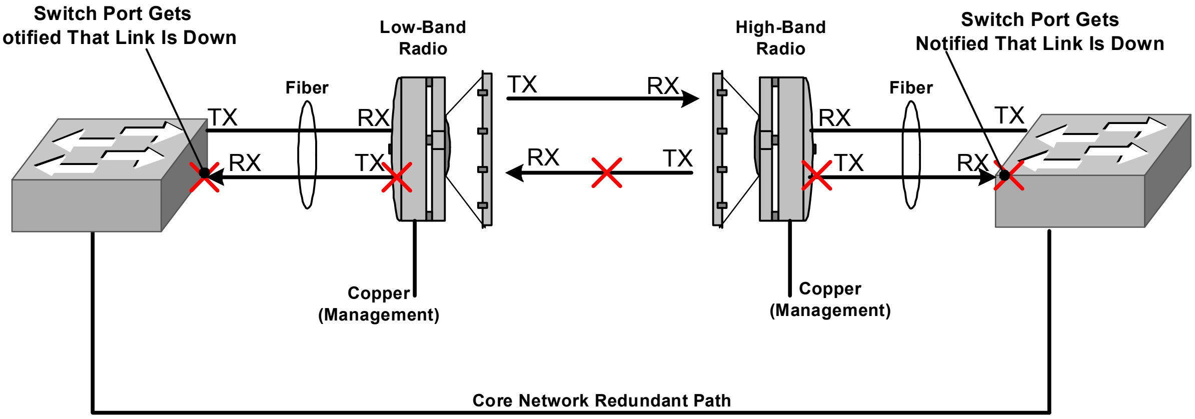


Figure 4-2 LSP

Note	***LSP:*** *Access to the web and SNMP management functionality will not be possible if the radio is being managed In-band through the fiber interface and LSP has disabled the fiber interface. Restoration of the radio link will be required in order to regain access to the equipment.* *If the LSP feature is enabled it is highly recommended to enable copper In-Band or Out-Band management. This will allow for access to the units if the radio link is in a down state.*

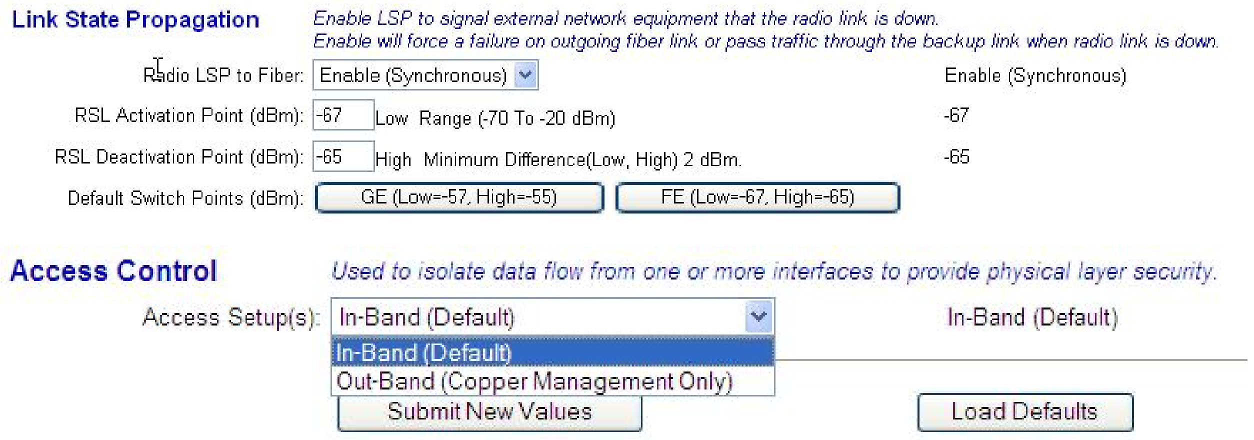
Note	***LSP:*** *LSP recovers faster if auto negotiation is disabled on the fiber interface of the radio. It is recommended to disable auto negotiation and flow control on the attached network equipment and disable auto negotiation on the radios fiber interface if using the LSP feature.*

Use the following steps to configure Synchronous LSP:

After the equipment is installed, perform the following suggested steps to setup the function.

1. In the ‘Setup’ page, set both High band and Low band radios Radio LSP to Fiber selection to ‘Enabled’
2. In the High band radio, and for AR, press both of the Default Switch Points button to set the RSL trigger points to achieve GE to FE and then to LSP rate switching. The RSL fields will then be filled in with the default values. For GE or Fe only systems, only one FE or GE default button will be available.

3. Select Access control to either ‘In-Band (Default) or Out-Band (Copper Management Only) at both Radios
4. Press the ‘Submit New Values’ button at both radios.



Link State Propagation *Enable LSP to signal external network equipment that the radio link is down. Enable will force a failure on outgoing fiber link or pass traffic through the backup link when radio link is down.*

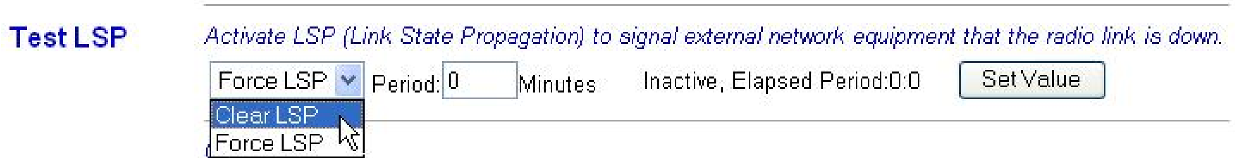
Radio LSP to Fiber:	Enable (Synchronous)	Enable (Synchronous)
RSL Activation Point (dBm):	-67 Low Range (-70 To -20 dBm)	-67
RSL Deactivation Point (dBm):	-65 High Minimum Difference(Low, High) 2 dBm.	-65
Default Switch Points (dBm):	GE (Low=-57, High=-55) FE (Low=-67, High=-65)	

Access Control *Used to isolate data flow from one or more interfaces to provide physical layer security.*

Access Setup(s): In-Band (Default) — In-Band (Default)

Testing the LSP function(s):

1. Put test apparatus or computers at each end of the link to ping or run traffic across the link
2. In the High band Radio’s ‘Maintenance’ page, set ‘Force LSP” and set the duration of the test to 1-99 minutes. The High band radio activates the function for both ends of the link and the ‘Force LSP’ control will not be seen on the Low band radio
3. Press the ‘Set Value’ button
4. For an AdaptPath™ link, observe that the traffic is still flowing in the secondary path
5. For a LSP link, verify that both fiber transmitters are down.
6. Return the system to the ‘Clear LSP’ state. (Or wait for the function to timeout)



Test LSP *Activate LSP (Link State Propagation) to signal external network equipment that the radio link is down.*

Force LSP Period: 0 Minutes Inactive, Elapsed Period:0:0

4.6 Access Control

The ‘Access Control’ option performs two functions. One is to specify which interfaces will be allowed access to the internal management agent for web and SNMP access. The second is to specify the configuration of the internal switch with respect to In-Band or Out-Band management. Detailed information about the In-Band and Out-Band options are provided in Section 4.6.1 and 4.6.2.

4.6.1 In-Band (Default)

This option allows for management of each radio terminal through the copper, fiber, and/or radio interface. When the 'Access Control' parameter on the 'Setup' page is configured for In-Band the internal switch places the copper, fiber and radio interfaces onto the same internal VLAN.

This effectively places the copper port into the same broadcast domain (LAN segment) as the fiber and radio interfaces. A single MAC learning table is then used for all ports. A user can then select if the management agent can be accessed from the fiber or radio interfaces in addition to the copper interface.

⚠ **Warning**	*Connecting both the copper and fiber interfaces to the same network or switch when 'In-Band' is selected can create network loops, broadcast storms, and other problems that can bring down the core network.*

Note	*When 'In-Band' is selected, broadcast or multicast traffic exceeding 10 Mbps can flood the internal management agent preventing web access to the unit. This does not impact the availability of the link.*

Figure 4-3 provides a logical diagram of the internal switch when Copper In-Band is selected.

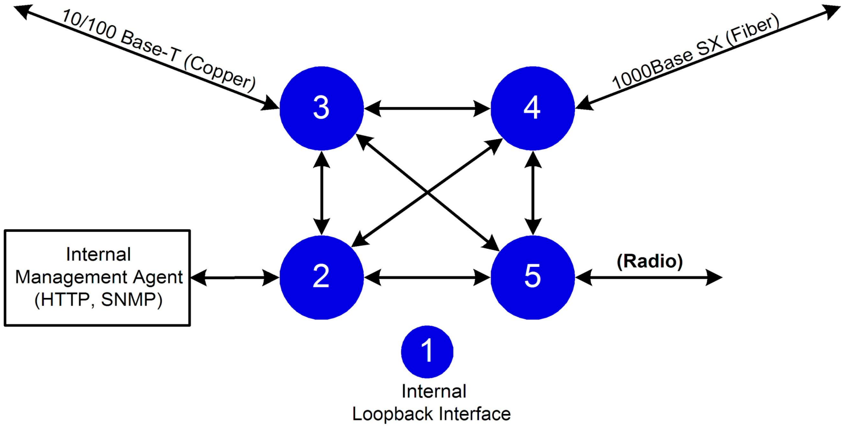


Figure 4-3 In-Band Management

4.6.2 Copper Out-Band

This option allows for management of each radio terminal through the copper interface, while keeping the management traffic isolated from the core network traffic.

When the ‘Access Control’ parameter on the ‘Setup’ page is configured for Out-Band (Copper Management Only), the internal switch isolates the copper interface from the fiber and radio interfaces by placing it into a separate port based VLAN.

This effectively places the copper port into its own broadcast domain (LAN segment). Figure 4-4 provides a logical diagram of the internal switch when Copper Out-Band is selected.

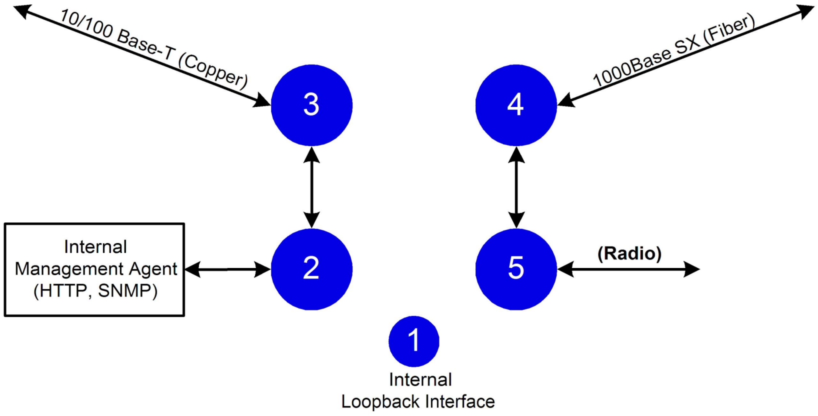

10/100 Base-T (Copper)
1000Base SX (Fiber)
3
4
Internal Management Agent (HTTP, SNMP)
2
5
(Radio)
1
Internal Loopback Interface

Figure 4-4 Out-Band, Copper Management Only

When ‘Out-Band’ is selected, one way to manage the remote radio from the local side is accomplished through the use of VLAN in the network equipment at both ends of the link.

The management traffic is isolated between the copper and fiber ports by VLAN and then transported through a connection over the fiber and radio interface.

An example of this is depicted in Figure 4-5 where an 802.1Q VLAN trunk is used to allow the management station to access the remote radios copper port.

The switches keep the core network traffic and the management network traffic secure and separate from one another.

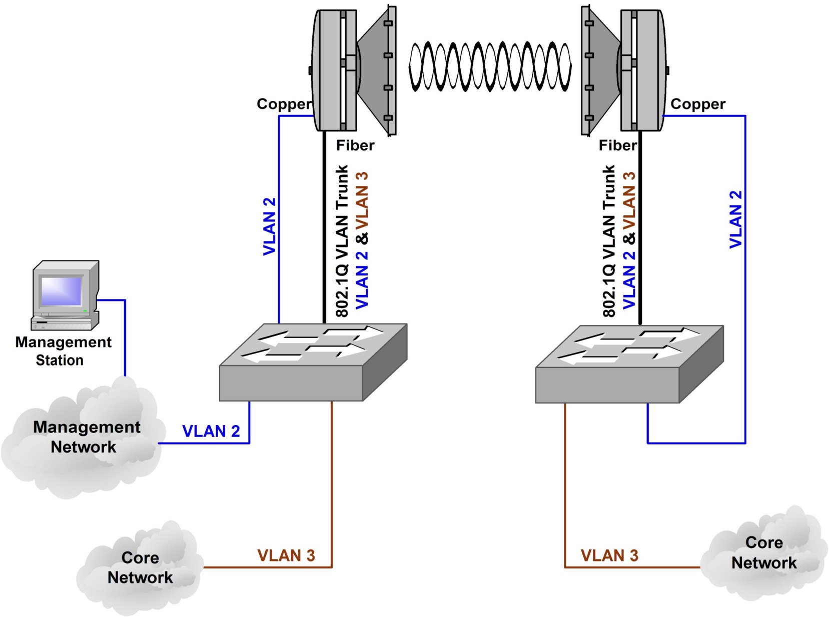
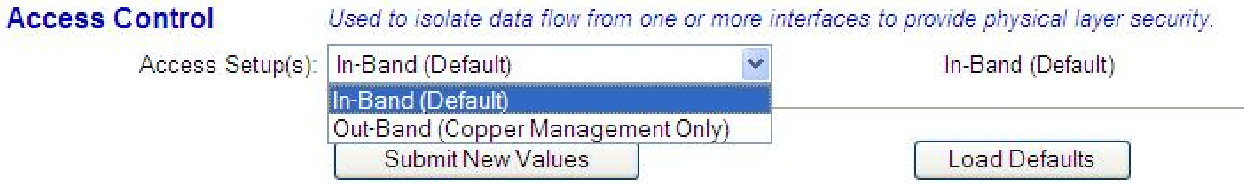


Figure 4-5 Out-Band Management Network Deployment Example

4.6.3 Configuring Management Access

Use the following steps to configure the 'Management Access' option:

1. Connect to the web management interface of the unit and select the 'Setup' tab.
2. Under the 'Access Control' section select the desired 'In-Band (Default)', or 'Out-Band (Copper Management Only)' option.



Access Control *Used to isolate data flow from one or more interfaces to provide physical layer security.*

Access Setup(s): In-Band (Default) In-Band (Default)

When 'In-Band' is selected the internal switch is configured so that the copper, fiber, and radio interfaces are placed onto the same LAN and the option to allow management access on the Fiber and/or the radio interface becomes available.

When 'Out-Band' is selected the Copper interface is placed into a separate LAN on the internal switch and becomes physically isolated from the fiber and radio interfaces. When this option is enabled the management interface of the unit can only be accessed through a connection to the copper port.

3. Click the ‘Submit New Values’ button at the bottom of the ‘Setup’ page for the changes to become active.

4.7 IP Setup

The network addressing options are configured from the ‘IP Setup’ page of the web management interface. The network administrator would typically provide these values.
Use the following steps to configure IP Setup parameters:

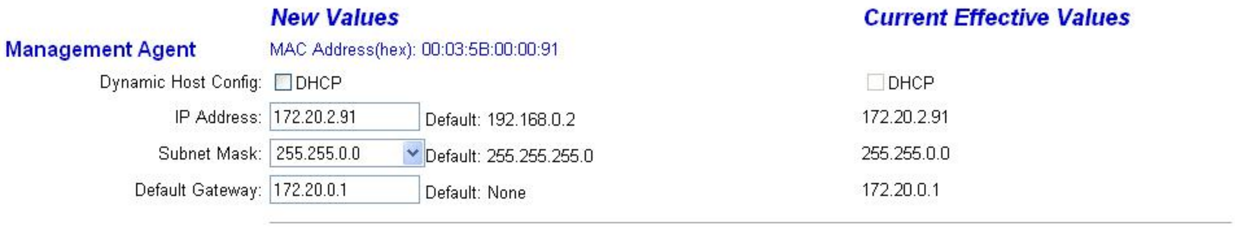
1. Connect to the web management interface of the unit and select the ‘IP Setup’ tab.
2. Under the ‘Management Agent’ section configure the parameters listed below:

   Dynamic Host Config – Checking the DHCP box enables the unit to receive an IP address, subnet mask and default gateway from the network’s DHCP server. Un-checking the box disables the DHCP function.

   IP address – Allows for static configuration of the IP address for the management agent. The factory default for the Low-Band radio is 192.168.0.1 and the High-Band radio is 192.168.0.2.

   Subnet mask – The subnet mask can be configured by picking the desired value from the Pull-down menu.

   Default Gateway – Sets the default gateway address for this radio. Leave blank if no default gateway is to be used.
3. Select ‘Submit New Values’ at the bottom of the ‘IP Setup’ page. The current values will be displayed in Red under the Current Effective Values column, along with a (Soft Restart Pending) message.



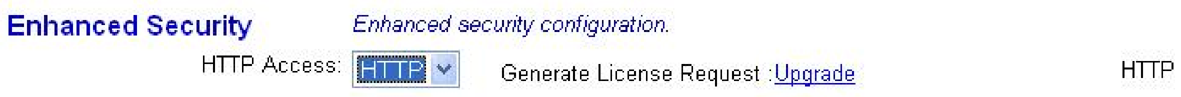
	New Values		Current Effective Values
Management Agent	MAC Address(hex): 00:03:5B:00:00:91		
Dynamic Host Config:	☐ DHCP		☐ DHCP
IP Address:	172.20.2.91	Default: 192.168.0.2	172.20.2.91
Subnet Mask:	255.255.0.0	Default: 255.255.255.0	255.255.0.0
Default Gateway:	172.20.0.1	Default: None	172.20.0.1

4. Click the ‘Soft Restart’ option at the bottom of the ‘IP Setup’ page to make the New Values active.

Note	*A ‘Soft Restart’ is required before a change to the Management Agent parameters will become active.*

Note	*After a restart it will take approximately 140 seconds for the web management interface to become accessible. The soft restart does not drop the radio link and data traffic will continue to flow.*

Advanced Security - If secure management is desired for Non-AES units, a license key to upgrade to HTTPS secure management can be purchased**. *Contact Sales for more information.***



Enhanced Security

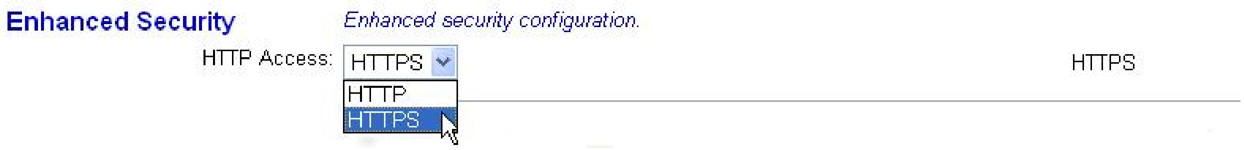
Enhanced security configuration.

HTTP Access: HTTP

Generate License Request :Upgrade

HTTP

AES and secure management equipped units, have the option of selecting non-secure HTTP rather than HTTPS in the IP Setup page



Enhanced Security

Enhanced security configuration.

HTTP Access: HTTPS

HTTP
HTTPS

HTTPS

5 Diagnostic Tools

The status of a link can be determined by viewing the information contained on the ‘Status’ and ‘Statistics’ pages of the units web interface.

The ‘Status’ page provides a variety of parameters that display Green, Yellow, or Red indications. A detailed description of the ‘Status’ page parameters are listed in Section 5.1.

The ‘Statistics’ page provides transmit and receive statistics counters for the Copper, Fiber, and Radio interfaces. Section 5.2 provides a detailed description of the statistics counters.

5.1 Status Page Indications

The Status page shows basic unit information including product model, band of operation, and MAC address, as well as the current state of the unit and its physical interfaces.

Green, yellow, and red status indicators provide a quick visual summary of the unit’s operating condition. Under normal operating conditions, all indicators should be green, unless one of the network interface ports is not in use.

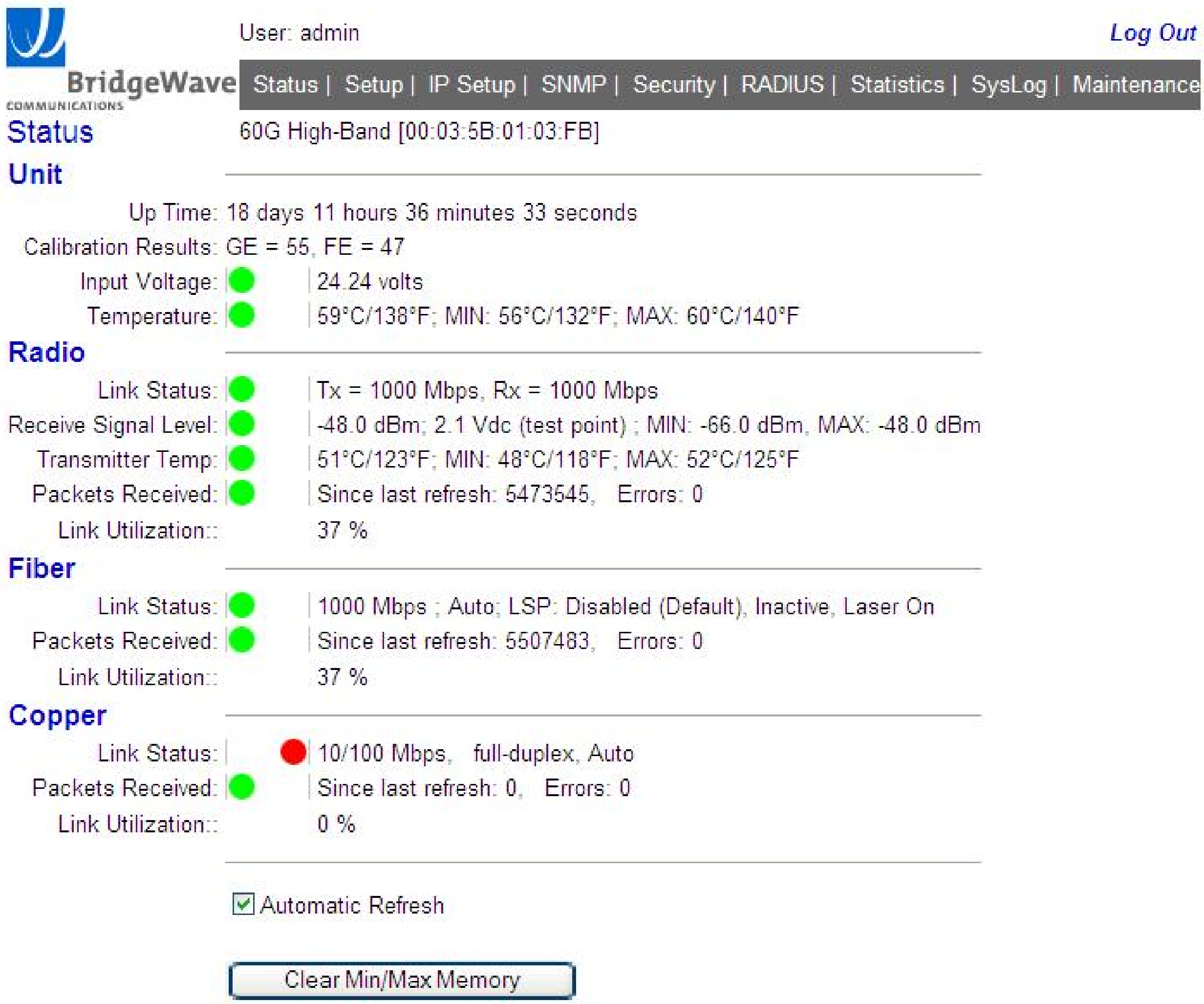
Red indicators signify unit failures, unconnected network interfaces, or abnormal operating conditions.

Yellow indicators signify marginal operating conditions, which may impact unit operation. The displayed information is updated with every refresh of the Status page and does not automatically update.

Not all values are updated in real time and may take several seconds to reflect the unit’s true operating status.

The ‘Automatic Refresh’ checkbox may be enabled to automatically refresh the screen every 10 seconds.

An example of the Status page is shown in Figure 5-1 and a definition of each parameter follows.


BridgeWave
COMMUNICATIONS
Log Out
Status | Setup | IP Setup | SNMP | Security | RADIUS | Statistics | SysLog | Maintenance
Clear Min/Max Memory

User: admin

Status

60G High-Band [00:03:5B:01:03:FB]

Unit

Up Time: 18 days 11 hours 36 minutes 33 seconds

Calibration Results: GE = 55, FE = 47

Input Voltage: 🟢 24.24 volts

Temperature: 🟢 59°C/138°F; MIN: 56°C/132°F; MAX: 60°C/140°F

Radio

Link Status: 🟢 Tx = 1000 Mbps, Rx = 1000 Mbps

Receive Signal Level: 🟢 -48.0 dBm; 2.1 Vdc (test point) ; MIN: -66.0 dBm, MAX: -48.0 dBm

Transmitter Temp: 🟢 51°C/123°F; MIN: 48°C/118°F; MAX: 52°C/125°F

Packets Received: 🟢 Since last refresh: 5473545, Errors: 0

Link Utilization:: 37 %

Fiber

Link Status: 🟢 1000 Mbps ; Auto; LSP: Disabled (Default), Inactive, Laser On

Packets Received: 🟢 Since last refresh: 5507483, Errors: 0

Link Utilization:: 37 %

Copper

Link Status: 🔴 10/100 Mbps, full-duplex, Auto

Packets Received: 🟢 Since last refresh: 0, Errors: 0

Link Utilization:: 0 %

☑ Automatic Refresh

Figure 5-1 Status Page

USER: Indicates the currently logged-in username

STATUS

Model: Indicates the type of unit.

High-Band or Low Band: Indicates the frequency band of the radio’s transmitter. A link consists of one low-band and one high-band radio.

MAC: Displays the MAC address of the management NMS interface.

UNIT

Up time: Time since last unit power cycle, soft restart, or hard restart.

Calibration Results: This parameter displays the results of the calibration performed during installation or via the 'Auto-Calibration' option performed from the maintenance page.

Note	*Prior to viewing the calibration results a 'Get Results' should be performed from the Maintenance screen of the web interface. This ensures that the displayed results are synchronized with the active values stored in the flash of the MCU.*

The results of the calibration are provided for 100 Mbps (FE), 1000 Mbps (GE), or both FE and GE modes for FE-U and AR products.

FE = This field displays the calibration results for the Fast Ethernet (FE) mode of operation. A good calibration will result in a value of 10 or higher being displayed. Higher values indicate better calibration results.

GE = This field displays the calibration results for the Gigabit Ethernet (GE) mode of operation. A good calibration will result in a value of 10 or higher being displayed. Higher values indicate better calibration results.

Note	*Calibration results that display slightly lower than 10 may be observed on links that are operating near the maximum distance recommendations.*

Input Voltage: Voltage present at unit power input connector

GREEN: ≥ 16 volts

RED: < 16 volts

Temperature: Temperature within unit enclosure

GREEN: Within specification (-20°C to 75°C) (-4°F to 167°F)

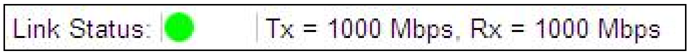
YELLOW: At operating limit

Min/Max temperature is also displayed from the last restart of the unit.

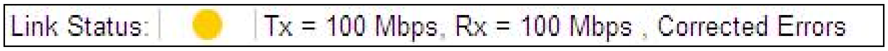
RADIO

Link Status: Speed and quality status of the radio interface

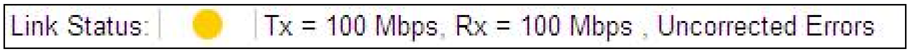
GREEN: Link is up, error-free


Link Status: ● | Tx = 1000 Mbps, Rx = 1000 Mbps

YELLOW: This indicates that errors in the transmission are occurring. The system contains built in Forward Error Correction (FEC) that will correct most errors that occur near the receive signal threshold. If ‘Corrected Errors’ is displayed then the FEC is correcting all errors and the user traffic is unaffected.

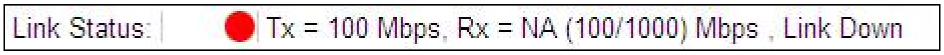

Link Status: ● | Tx = 100 Mbps, Rx = 100 Mbps , Corrected Errors

If ‘Uncorrected Errors’ is displayed the FEC is no longer able to correct all errors and some user data packets could be dropped. When ‘Uncorrected Errors’ is displayed, errors may show up on the receive statistics for the radio interface.


Link Status: ● | Tx = 100 Mbps, Rx = 100 Mbps , Uncorrected Errors

Note	*When the received radio signal is attenuated due to rain and the radio nears its receive threshold the Forward Error Correction (FEC) starts correcting errors. A ‘Yellow’ indication is normal under these conditions.*

RED: Link is down


Link Status: ● Tx = 100 Mbps, Rx = NA (100/1000) Mbps , Link Down

Receive Signal Level (RSL): Signal level in dBm and alignment voltage present at unit test point. This value is not updated in real time and can take 20 seconds to reflect current status.
For 1000 Mbps (GE) link speed:

GREEN:	≥ -55dBm
YELLOW:	Between -55 and -59dBm
RED:	< -59dBm

For 100 Mbps (FE) link speed:

GREEN:	≥ -65dBm
YELLOW:	Between -65 and -69dBm
RED:	< -69dBm

Min/Max RSL is also displayed from the last restart of the unit or from the Clear Min/Max Memory Button on the Status page:

Transmitter Temp: Internal temperature of the radio transmitter

GREEN: Within specification (-20°C to 75°C) (-4°F to 167°F)

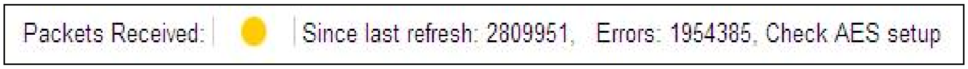
YELLOW: At operating limit

Min/Max transmitter temperature is also displayed from the last restart of the unit.

Packets Received: Number of packets received by the radio interface since last refresh of the management interface from any active user session.

GREEN: No packet errors (dropped packets) since last refresh

YELLOW: One or more packet errors since last refresh. The 'Check AES setup' message is displayed, as shown below, if errors are occurring and AES encryption is enabled on only one end of the link, or the key does not match on each end.



Packets Received: ● Since last refresh: 2809951, Errors: 1954385, Check AES setup

Link Utilization: Percentage of total link capacity in use. This value is calculated once every minute and displayed until the next calculation period.

FIBER

Link Status: Speed, auto negotiation setting, LSP and Laser on/off status message of fiber interface

GREEN: Port is up

RED: Port is down

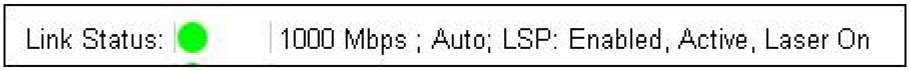
Packets Received: Number of packets received by the fiber interface since last refresh of the management interface from any active user session.

GREEN: No packet errors since last refresh

YELLOW: One or more packet errors since last refresh

Link Utilization: Percentage of total link capacity in use. This value is calculated once every minute and displayed until the next calculation period.

LSP Related Information: This example shows that LSP is enabled and active and the Laser is on:



Link Status: ● 1000 Mbps ; Auto; LSP: Enabled, Active, Laser On

COPPER

Link Status: Displays the physical status and copper backup active message for the 10/100Base-T copper interface.

GREEN:	Port is up
RED:	Port is down (Normal if copper port is not used)

⚠ Note	*The Copper interface is set for Auto Negotiation only.* *The negotiated speed and duplex are displayed*

Packets Received: Number of packets received by the copper interface since last refresh of the management interface from any active user session.

GREEN:	No packet errors since last refresh
YELLOW:	One or more packet errors since last refresh

Link Utilization: Percentage of total link capacity in use. This value is calculated once every minute and displayed until the next calculation period.

Automatic Refresh: The statistics page will automatically update every 10 seconds when this parameter is enabled.

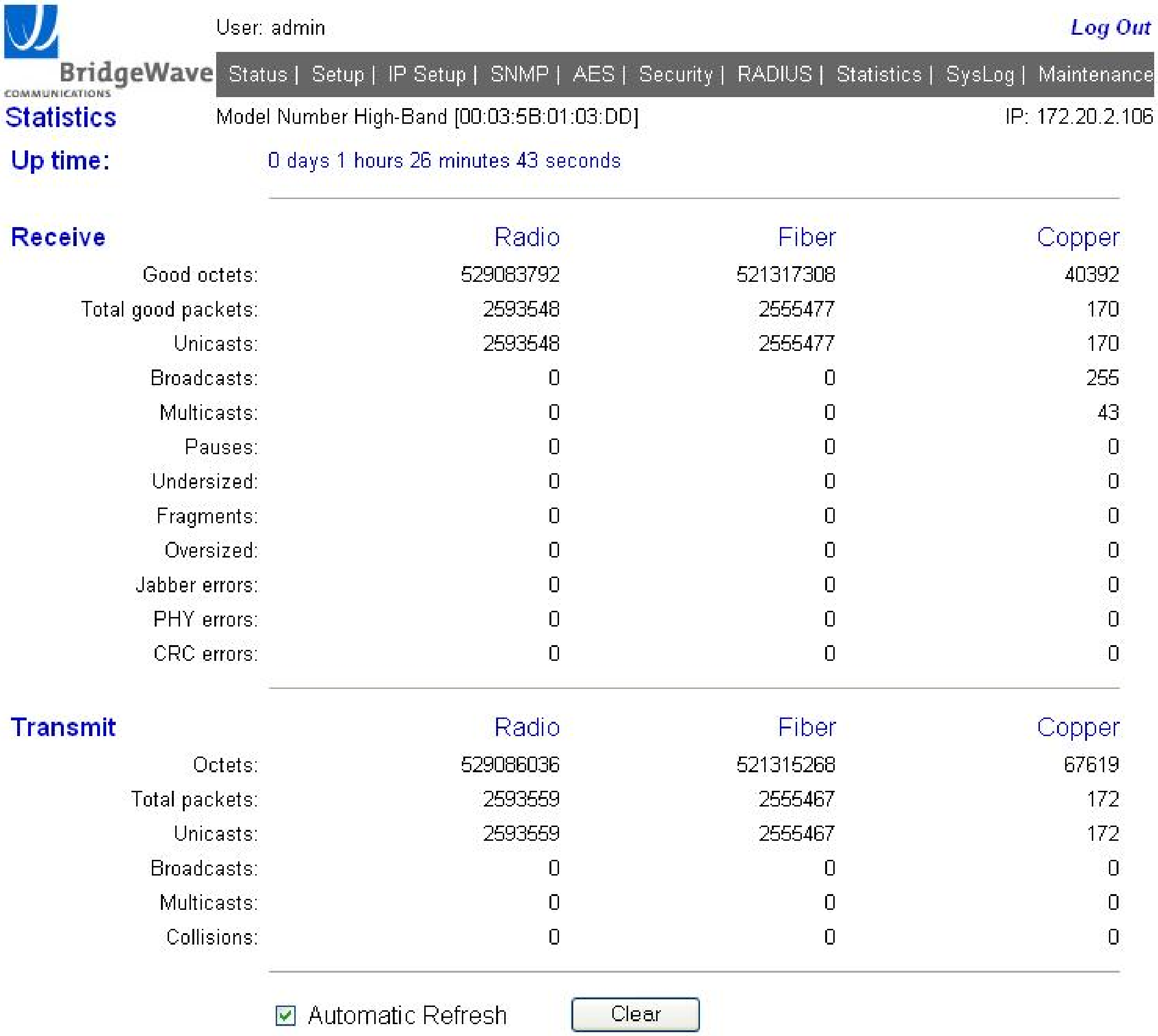
⚠ Warning	*The web interface will not automatically log off inactive users if the Automatic Refresh option is enabled and the browser window is left on the Status page. Select the Log Out option to prevent un-authorized access to the unit.*

5.2 Viewing Statistics

The 'Statistics' page of the web interface displays received and transmitted Ethernet packet statistics for the copper, fiber, and radio interfaces. These values allow the user to see where packets are dropped due to corrupted or invalid contents, determine the flow of packets between the interfaces, and determine the rate that data is moving through the system.

⚠ Note	*'Receive' and 'Transmit' are relative to the switch port; e.g., a packet transmitted on the fiber interface is a packet sent from the fiber interface of the unit to the user's network equipment.*

An example of the 'Statistics' page is shown in Figure 5-2 and a definition of each parameter follows.


BridgeWave
COMMUNICATIONS
Log Out
Status | Setup | IP Setup | SNMP | AES | Security | RADIUS | Statistics | SysLog | Maintenance

User: admin

Statistics

Model Number High-Band [00:03:5B:01:03:DD]

IP: 172.20.2.106

Up time: 0 days 1 hours 26 minutes 43 seconds

Receive	Radio	Fiber	Copper
Good octets:	529083792	521317308	40392
Total good packets:	2593548	2555477	170
Unicasts:	2593548	2555477	170
Broadcasts:	0	0	255
Multicasts:	0	0	43
Pauses:	0	0	0
Undersized:	0	0	0
Fragments:	0	0	0
Oversized:	0	0	0
Jabber errors:	0	0	0
PHY errors:	0	0	0
CRC errors:	0	0	0

Transmit	Radio	Fiber	Copper
Octets:	529086036	521315268	67619
Total packets:	2593559	2555467	172
Unicasts:	2593559	2555467	172
Broadcasts:	0	0	0
Multicasts:	0	0	0
Collisions:	0	0	0

☑ Automatic Refresh

Figure 5-2 Statistics Page

5.2.1 Receive and Transmit

Good Octets: An octet is a sequence of eight bits. Since a byte is not eight bits in all computer systems, *octet* provides an unambiguous term. . When a packet is in error, none of the octets are counted as “good”.

Total good packets: Total number of packets without errors received. For the transmit direction this is expressed as total packets sent, since only good packets are sent.

Unicast: Total number of frames that have a unicast destination MAC address. Unicast frames are addressed to a single host on a LAN.

Broadcasts: Total number of good frames that have a broadcast destination MAC address. Broadcast frames are addressed to all hosts on a LAN.

Multicasts: Total number of good frames that have a multicast destination. Multicast are frames addressed to a subset of hosts on a LAN.

Pauses: Pause frames are sent if flow control is enabled and a port needs to temporarily stop the flow of incoming packets.

Undersized: Total number of frames received with a length less than 64 octets but with a valid FCS.

Fragments: Total number of frames received with a length less than 64 octets and an invalid FCS.

Oversized: Total number of frames received with a length that exceeds 1632 bytes but with a valid FCS. These errors are caused either by damaged packets or by user network equipment being configured to transmit jumbo frames.

Jabber errors: Total number of frames received with a length that exceeds 1632bytes but with an invalid FCS.

PHY errors: Receive errors on the physical interface.

CRC errors: Short for Cyclic Redundancy Check, CRC is a method of detecting errors in data transmission. A CRC is control information sent with a block of data that when received can be used to verify that all data was received correctly. CRC errors typically indicate physical defects in fiber or copper cabling, or poor receive signal quality on a radio link. One or less CRC errors every 16 minutes on a fully-loaded 1000 Mbps link would equal a bit error rate of under 10^{-12} and is considered excellent performance for fiber or radio connections. One CRC error every 90 seconds would equal a bit error rate of 10^{-10} on a 100 Mbps copper connection, which complies with 100Base-TX specifications. While higher error rates should normally only be seen during short periods of heavy rain downpours, most LAN applications can easily tolerate 10^{-8} bit error rates without noticeable degradation.

Collisions: Total number of collisions detected. Collisions indicate that more than one device is transmitting packets to an Ethernet hub at the same time, and will normally be detected by the device itself and be re-transmitted. Collisions should not occur when devices are connected through Ethernet switches in full duplex mode.

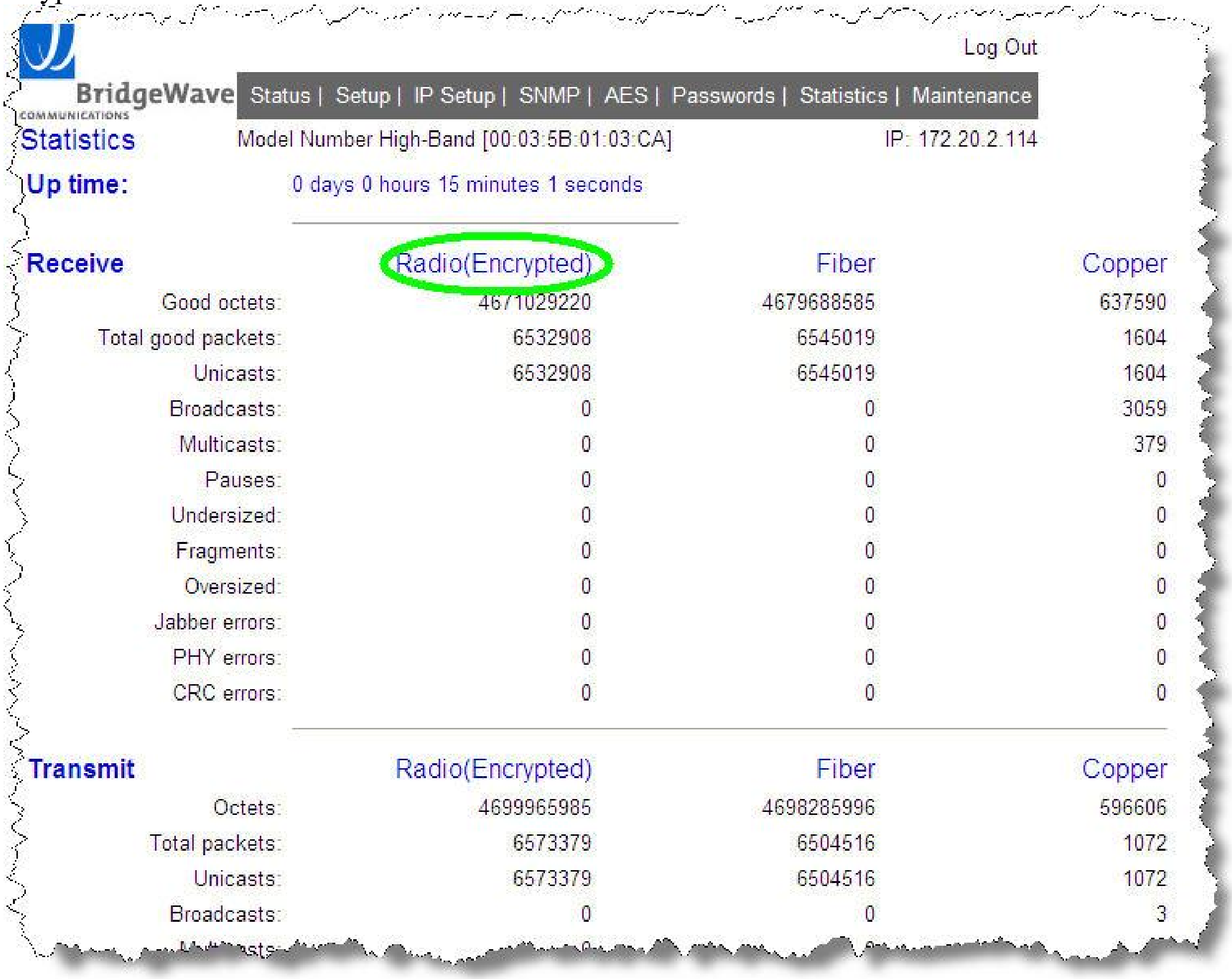
Automatic Refresh: The statistics page will automatically update every 10 seconds when this parameter is enabled.

⚠ **Warning**	*The web interface will not automatically log off inactive users if the Automatic Refresh option is enabled and the browser window is left on the Statistics page. Select the Log Out option to prevent un-authorized access to the unit.*

Clear: Resets all statistics counters to zero.

5.3 AES Statistics

In AES systems transmitting encrypted data, the statistics screen will appear slightly different as shown in Figure 5-3, Statistics screen for AES encrypted traffic, indicating that the Radio traffic is encrypted


Log Out
BridgeWave
COMMUNICATIONS
Status | Setup | IP Setup | SNMP | AES | Passwords | Statistics | Maintenance

Statistics Model Number High-Band [00:03:5B:01:03:CA] IP: 172.20.2.114

Up time: 0 days 0 hours 15 minutes 1 seconds

Receive	Radio(Encrypted)	Fiber	Copper
Good octets:	4671029220	4679688585	637590
Total good packets:	6532908	6545019	1604
Unicasts:	6532908	6545019	1604
Broadcasts:	0	0	3059
Multicasts:	0	0	379
Pauses:	0	0	0
Undersized:	0	0	0
Fragments:	0	0	0
Oversized:	0	0	0
Jabber errors:	0	0	0
PHY errors:	0	0	0
CRC errors:	0	0	0

Transmit	Radio(Encrypted)	Fiber	Copper
Octets:	4699965985	4698285996	596606
Total packets:	6573379	6504516	1072
Unicasts:	6573379	6504516	1072
Broadcasts:	0	0	3
Multicasts:	0	0	

Figure 5-3, Statistics screen for AES encrypted traffic

5.4 TX Mute Function

The Transmitter (TX) mute function can be useful for investigating and diagnosing interference related problems.

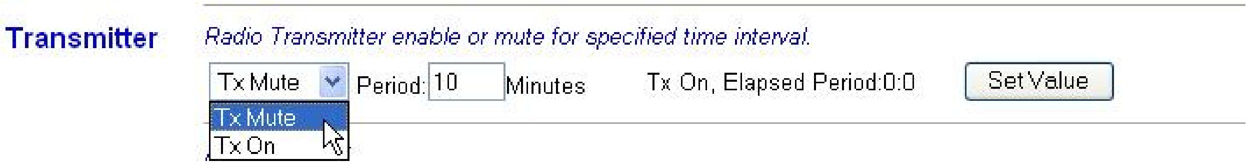
Use the following steps to mute the Transmitter

1. Connect to the web management interface of the unit and select the ‘Maintenance’ tab.
2. Under the Transmitter section, select TX Mute.
3. Select the amount of time required for the TX Mute operation. The range is 1-99 minutes.

Note	*A value of zero is always applied, no matter what value is entered for ‘TX ON’ and sets continuous operation.*

Note	*The value of zero and continuous operation of ‘TX Mute’ is not allowed.*

4. Press the ‘Set Value’ button and OK for the pop-up ‘Confirm Operation’ window.
5. The elapsed time of the operation is shown upon refresh of the browser window



Transmitter

Radio Transmitter enable or mute for specified time interval.

Tx Mute Period: 10 Minutes Tx On, Elapsed Period:0:0

6 SNMP

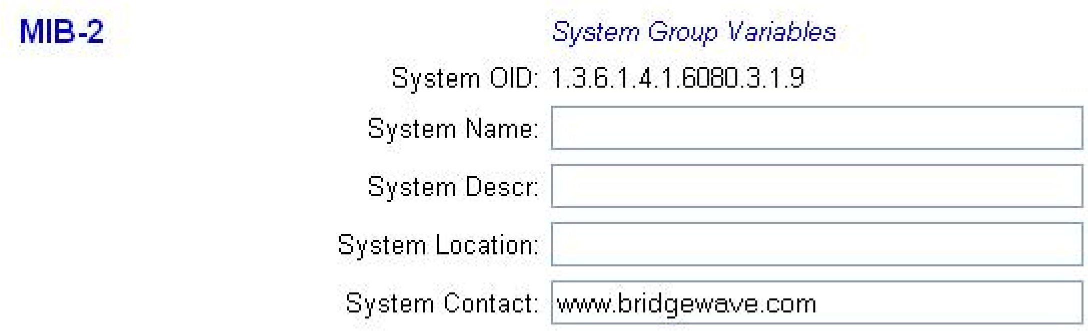
Simple Network Management Protocol (SNMP) is a standardized protocol used for monitoring and controlling various elements within a network. All BridgeWave products that are network management enabled provide SNMP V2 support for GET and SET commands on MIB-2 and BridgeWave enterprise MIB objects. Traps are sent in SNMP V1 format.

SNMP V1 and V2 MIBS are included in .zip file for each software release. The .zip software release packages can be downloaded from the BridgeWave Support web site at the following url: http://www.bridgewave.com/support/downloads.cfm

6.1 Configuring SNMP

A majority of the SNMP related configuration parameters are located on the 'SNMP' tab of the web interface.
Use the following steps to configure SNMP.

1. Select the 'SNMP' tab from the web browser interface of the unit.
2. Enter the MIB-2 system group variables. These fields may be populated with any desired name(s), descriptions, locations and appropriate system contact for identification purposes. A definition of each parameter is listed below:



MIB-2

System Group Variables

System OID: 1.3.6.1.4.1.6080.3.1.9
System Name:
System Descr:
System Location:
System Contact: www.bridgewave.com

System OID: 1.3.6.1.4.1.6080.3.1.9 Identification of the network management subsystem contained in this entity.

System Name: Typically an administratively assigned name for this managed node. By convention, this is the node's fully qualified domain name.

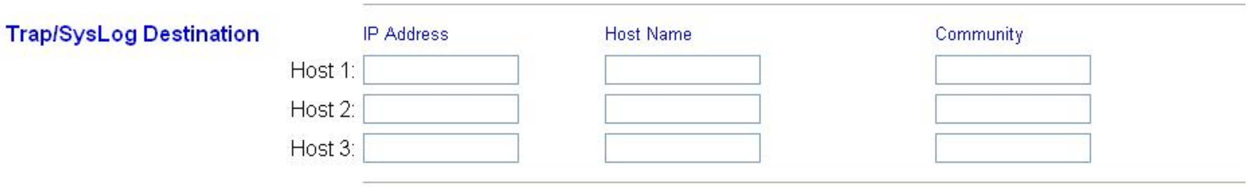
System Descr: Enter a brief description of the system.

Note	*This information will be displayed at the top of all web pages once filled out.*

System Location: Enter a value that describes the physical location of the unit such as address or building name.

System Contact: Identification of the contact person for this managed node, together with information on how to contact this person.

3. Next, enter the 'IP address', 'Host Name', and trap 'Community' of the management station(s) that will be monitoring this unit. All SNMP alarms (traps) will be sent to the host specified in this section. A maximum of three trap destinations can be configured.



Trap/SysLog Destination

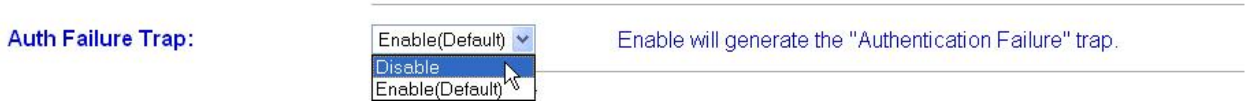
	IP Address	Host Name	Community
Host 1:			
Host 2:			
Host 3:			

IP Address: The IP address destination of the host to receive traps

Host Name: The host name assigned to the management station receiving the traps.

Community: Value required by SNMP management station to authenticate incoming traps.

4. Enable or Disable the 'Auth Failure Trap'. When enabled a trap will be sent to the management agent if a SNMP read or read/write access to the unit is attempted using an invalid community string.

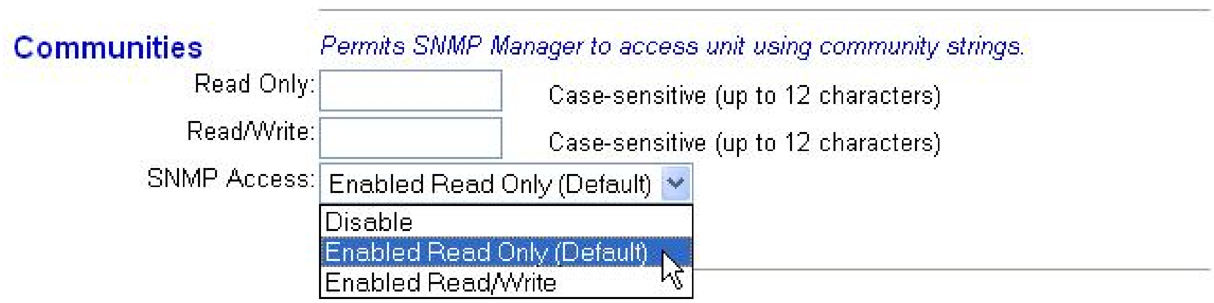


Auth Failure Trap: Enable(Default)

Enable will generate the "Authentication Failure" trap.

5. Select the 'Passwords' page from the web interface of the unit.

6. Under the 'Communities' section enter in the 'Read Only' and 'Read Write' community strings and 'SNMP Access' capabilities. Refer to Section 7.4 for a detailed description of these parameters.



Communities

Permits SNMP Manager to access unit using community strings.

Read Only: Case-sensitive (up to 12 characters)

Read/Write: Case-sensitive (up to 12 characters)

SNMP Access: Enabled Read Only (Default)

6.2 SNMP MIB Information

BridgeWave supplies an enterprise MIB file that provides definitions of objects beyond the standard MIB-2 objects. This MIB file can be found on the CD that is included with the product and on BridgeWave's website: http://www.bridgewave.com/support/downloads.cfm. To install the BridgeWave MIB file on your network management station, follow the instructions provided with your network management station software.

Note *Standard MIB-2 objects can be accessed without installing the BridgeWave MIB file.*

Supported MIB-2 Groups

Table 6.2-1 MIB-2 Groups

Name	OID
system	1.3.6.1.2.1.1
interfaces	1.3.6.1.4.1.2
at	1.3.6.1.4.1.3
ip	1.3.6.1.4.1.4
icmp	1.3.6.1.4.1.5
tcp	1.3.6.1.4.1.6
udp	1.3.6.1.4.1.7
egp	1.3.6.1.4.1.8
transmission	1.3.6.1.4.1.10
snmp	1.3.6.1.4.1.11

Equipment Interfaces

The MIB-2 interface table is always populated with the following five entries. 1 (Lo) = Loop-back, 2 (eth0) = Management port, 3 (ethCopper) = Copper port, 4 (ethFiber) = Fiber port, and 5 (ethRadio) = Radio port

BridgeWave Enterprise MIB Objects

Table 6.2-2 BridgeWave Enterprise MIB Objects

Name	OID	Description
brwaveUnitSn	1.3.6.1.4.1.6080.2.1 brwaveCommon 1	Unit serial number
brwaveUnitModel	1.3.6.1.4.1.6080.2.2 brwaveCommon 2	Unit Model Number
brwaveTrapCount	1.3.6.1.4.1.6080.2.6 brwaveCommon 6	Traps generated by a given unit
brwaveRadioTxBand	1.3.6.1.4.1.6080.3.1.2.1 brwaveFactorySetup 1	Radio’s transmitting frequency band
brwaveRadioFactoryRate	1.3.6.1.4.1.6080.3.1.2.3 brwaveFactorySetup 3	Radio’s operating data rate
brwaveRadioInVoltage	1.3.6.1.4.1.6080.3.1.3.1 brwaveRadioStatus 1	Radio’s Input voltage
brwaveRadioUnit Temperature	1.3.6.1.4.1.6080.3.1.3.2 brwaveRadioStatus 2	Radio’s internal unit temperature
brRadioTxTemperature	1.3.6.1.4.1.6080.3.1.3.3 brwaveRadioStatus 3	Radio’s transmitter temperature
brwaveRadioRSL	1.3.6.1.4.1.6080.3.1.3.4 brwaveRadioStatus 4	Receive Signal Level
brwaveRadioRSLVoltage	1.3.6.1.4.1.6080.3.1.3.5 brwaveRadioStatus 5	Corresponding Voltage of RSL
brwaveRadioAbsRSL	1.3.6.1.4.1.6080.3.1.3.6 brwaveRadioStatus 6	Received Signal Level. The signal level of the received radio frequency in dBm
BrwaveRadioRSLVoltageInt	1.3.6.1.4.1.6080.3.1.3.7 brwaveRadioStatus 7	Received Signal Level measured as Voltage
brwaveCopperUtilization	1.3.6.1.4.1.6080.3.1.3.8 brwaveRadioStatus 8	% payload utilization on copper port
brwaveFiberUtilization	1.3.6.1.4.1.6080.3.1.3.9 brwaveRadioStatus 9	% payload utilization on fiber port
brwaveRadioUtilization	1.3.6.1.4.1.6080.3.1.3.10 brwaveRadioStatus 10	% payload utilization on radio port

BridgeWave Enterprise MIB Traps

Table 6.2-3 Bridgewave Enterprise MIB Traps

Name	OID	Description
brwaveErrorsOverThreshold	1.3.6.1.4.1.6080.3.1.9.0.1 brwaveRadioEventsV2 1	Link has error rate over threshold. When radio link has taken more than 1000 errors in 4 seconds.
brwaveErrorsUnderThreshold	1.3.6.1.4.1.6080.3.1.9.0.2 brwaveRadioEventsV2 2	Link error rate changed from over to under threshold. When radio link returns to an error-free state for at least 4 seconds.
brwaveUnitTemperatureAbnormal	1.3.6.1.4.1.6080.3.1.9.0.3 brwaveRadioEventsV2 3	Radio unit temperature not in normal operating range. Normal range is: -20°C to +75°C
brwaveUnitTemperatureNormal	1.3.6.1.4.1.6080.3.1.9.0.4 brwaveRadioEventsV2 4	Unit temperature restores from abnormal to normal range
brwaveTxTemperatureAbnormal	1.3.6.1.4.1.6080.3.1.9.0.5 brwaveRadioEventsV2 5	Transmitter temperature is not in normal operating range. Normal range is: -20°C to +75°C
brwaveTxTemperatureNormal	1.3.6.1.4.1.6080.3.1.9.0.6 brwaveRadioEventsV2 6	Transmitter temperature is restored to normal range
brwaveInputVolatgeAbnormal	1.3.6.1.4.1.6080.3.1.9.0.7 brwaveRadioEventsV2 7	Unit's input voltage is not in normal range. Normal input voltage > 16 Volts.
BrwaveInputVolatgeNormal	1.3.6.1.4.1.6080.3.1.9.0.8 brwaveRadioEventsV2 8	Unit's input voltage is restored to normal range
brwaveRslNormal	1.3.6.1.4.1.6080.3.1.9.0.10 brwaveRadioEventsV2 10	Received Signal Level is normal. Normal signal level > -55.00 dBm (GE mode) and > -65.00 dBm (FE mode)
brwaveRslMinor	1.3.6.1.4.1.6080.3.1.9.0.11 brwaveRadioEventsV2 11	Received Signal Level dropped to the level of minor event. When RSL between -55.00 to -59 dBm (GE mode) OR -65.00 to -69.00 dBm (FE mode)
brwaveRslMajor	1.3.6.1.4.1.6080.3.1.9.0.13 brwaveRadioEventsV2 13	RSL dropped to the level of major event. RSL < -59.00 dBm (GE mode) or RSL < -69 dBm (FE mode).
brwaveConfigChange	1.3.6.1.4.1.6080.3.1.9.0.26 brwaveRadioEventsV2 26	When web client has performed configuration changes or clearing of statistics.
brwaveLoginSuccessfull	1.3.6.1.4.1.6080.3.1.9.0.27 brwaveRadioEventsV2 27	Upon successful user log in to the web interface. (Obsolete)
brwaveGeToFeSwitch	1.3.6.1.4.1.6080.3.1.9.0.28 brwaveRadioEventsV2 28	AR rate switch from GE to FE mode. Current RSL value is included
brwaveFeToGeSwitch	1.3.6.1.4.1.6080.3.1.9.0.29 brwaveRadioEventsV2 29	AR rate switch from FE to GE mode. Current RSL value is included

7 User Accounts & Passwords

The management agent supports two types of users, with varying capabilities. The Administrator (username='admin') may view status and statistics, view/modify unit configuration, and perform maintenance functions (including software update). The User (username='user') may view status, configuration, and statistics, but is prevented from modifying unit configuration or performing maintenance functions.

Note	*Multiple users may concurrently access the radio management agent from different browser windows. If multiple users are logged on as Administrator, they are all permitted to independently modify the unit's configuration.*

The 'Security' page of the web management interface allows the Administrator to set the User, Administrator and Factory Access passwords and SNMP community names. These changes take effect immediately upon clicking the Submit buttons. It is important to remember the passwords that have been assigned to the unit. If a password is forgotten, it cannot be recovered; if this happens please refer to the Default Recovery (Hard Reset) section of this manual.

Remote Authentication Dial In User Service (RADIUS) may also be used to manage the user access of BridgeWave radios that are embedded in a network environment.

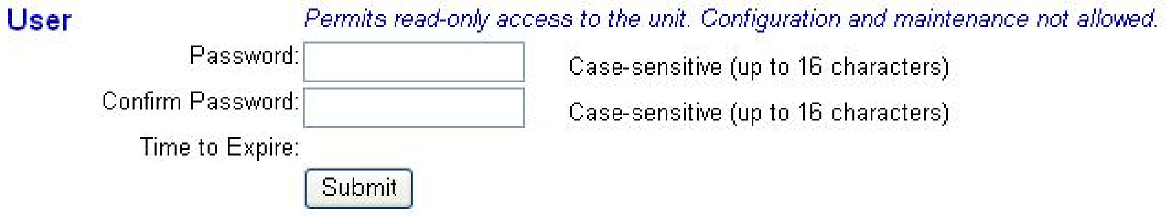
7.1 User

Permits read only capability such as viewing of unit status, configuration parameters and statistics. Does not permit modification of any parameter, setting passwords or performing maintenance functions. A history of the last 15 passwords is maintained to prevent password reuse. The user password can be set or reset by the administrator. The factory default user account name/password combination is: user/userpass

Password: The password is case-sensitive, may contain letters, numbers, and special characters, and can have a maximum of 16 alphanumeric characters. If the ‘Minimum Password Length’ option is enabled under the ‘Enhanced Security’ section then the password must contain 10 or more characters.

Confirm Password: Repeat the same password to validate.

Time to Expire: If a value other than 0 has been set in the ‘Password Expires’ field of the ‘Enhanced Security’ section this field will display the amount of time remaining until the password expires. If the password has expired, it will show how long since expiration and will be displayed in red. Only the ‘Admin’ user account has permissions to change the ‘Password Expires’ field.



User

Permits read-only access to the unit. Configuration and maintenance not allowed.

Password: Case-sensitive (up to 16 characters)

Confirm Password: Case-sensitive (up to 16 characters)

Time to Expire:

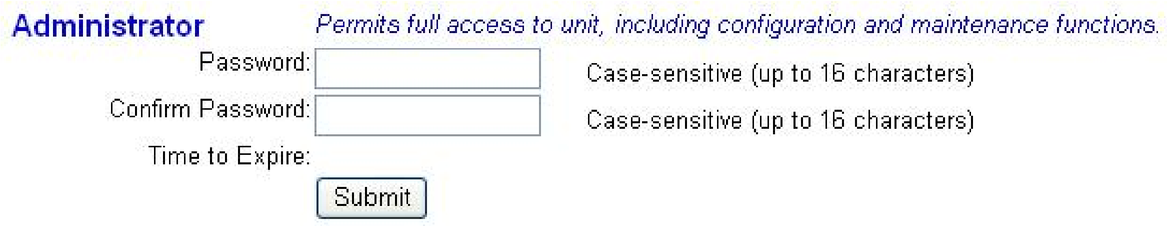
7.2 Administrator

Permits full access to unit, including configuration and maintenance functions. A history of the last 15 passwords is maintained to prevent password reuse. In order to recover a lost administrator password a hard reset is required. This will reset the unit to factory default values and requires a complete reconfiguration of the unit. The factory default admin account user name/password combination is: admin/adminpass

Password: The password is case-sensitive, may contain letters, numbers, and special characters, and can have a maximum of 16 alphanumeric characters. If the ‘Minimum Password Length’ option is enabled under the ‘Enhanced Security’ section then the password must contain 10 or more characters.

Confirm Password: Repeat the same password to validate.

Time to Expire: If a value other than 0 has been set in the 'Password Expires' field of the 'Enhanced Security' section this field will display the amount of time remaining until the password expires. If the password has expired, it will show how long since expiration and will be displayed in red. Once the password has expired, the 'admin' user will be forced to change the value of the password at the next login, before any other operations will be permitted. Only the 'admin' user account has permissions to change the 'Password Expires' field.



Administrator *Permits full access to unit, including configuration and maintenance functions.*

Password: Case-sensitive (up to 16 characters)

Confirm Password: Case-sensitive (up to 16 characters)

Time to Expire:

7.3 Factory Access

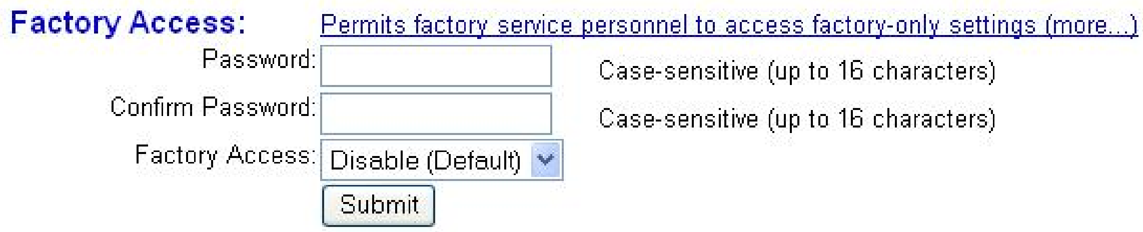
Permits BridgeWave factory service personnel to access the unit, including factory-only internal settings. In order for service personnel to access unit, this feature must be enabled and the administrator needs to set and provide an assigned password.

Password: The password is case-sensitive, may contain letters, numbers, and special characters, and can have a maximum of 16 alphanumeric characters. If the 'Minimum Password Length' option is enabled under the 'Enhanced Security' section then the password must contain 10 or more characters.

Confirm Password: Repeat the same password to validate.

Factory Access: Scroll menu to choose between 'Enabled and 'Disabled'. The default is for the access to be disabled.

Note	*For security reasons, the administrator should only enable factory access for the time of active access by BridgeWave factory service personnel. A power cycle or 'Hard Restart' will automatically change the factory access to disabled.*



Factory Access: Permits factory service personnel to access factory-only settings (more...)

Password: Case-sensitive (up to 16 characters)

Confirm Password: Case-sensitive (up to 16 characters)

Factory Access: Disable (Default)

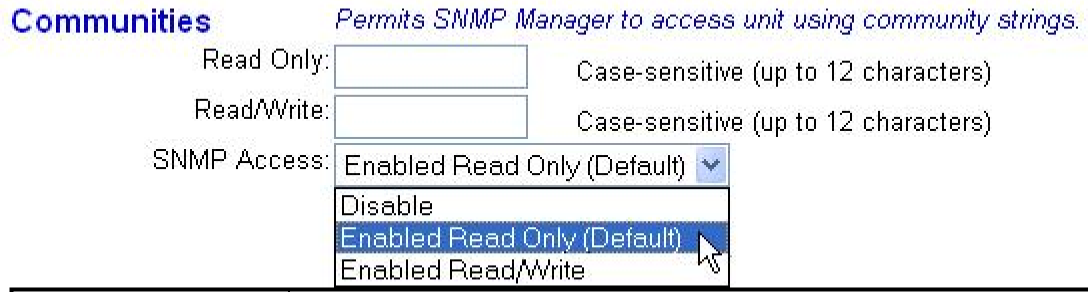
7.4 Communities

Read and write community strings are used for permitting SNMP management access. The Community strings are case-sensitive and can have 0-12 characters comprised of numbers, letters, or special characters.

Read Only: Used for authentication of SNMP GET request. Default value is ‘**public**’.

Read/Write: Used for authentication of SNMP SET request. Default value is ‘**private**’.

SNMP Access: This parameter allows for SNMP to be ‘Disabled’, ‘Enabled Read/Write’, or ‘Enabled Read Only (Default)’.



Communities Permits SNMP Manager to access unit using community strings.

Read Only: Case-sensitive (up to 12 characters)

Read/Write: Case-sensitive (up to 12 characters)

SNMP Access: Enabled Read Only (Default)

Note	*As part of the initial setup, if you do not intend to utilize the SNMP function, it is good practice to change the ‘SNMP Access’ to ‘Disabled’. This will prevent users from accessing the SNMP agent.*

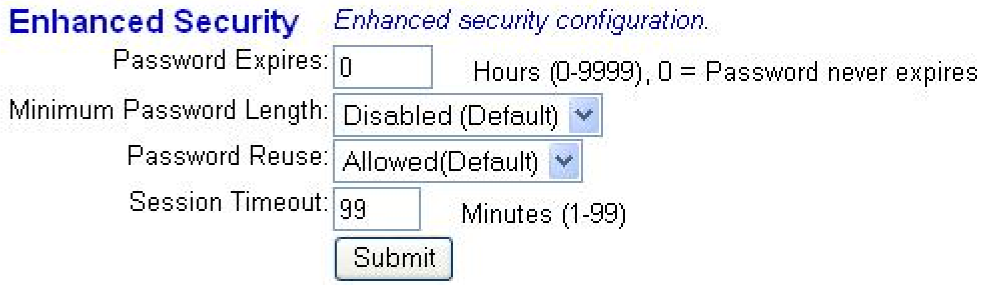
7.5 Enhanced Security

Permits password security configuration option to expire the password in the range of 0-9999 hours. If the value is set to zero, the password is maintained indefinitely.

Permits password security configuration option to set the minimum password length to 10 characters minimum. Disabled allows any length password. The maximum password length allowed is 16 characters.

Permits password security configuration option to allow or not allow password reuse.

Permits the extension of the time between automatic session timeouts to a value of 1-99 minutes.



Enhanced Security *Enhanced security configuration.*

Password Expires: 0 Hours (0-9999), 0 = Password never expires

Minimum Password Length: Disabled (Default)

Password Reuse: Allowed(Default)

Session Timeout: 99 Minutes (1-99)

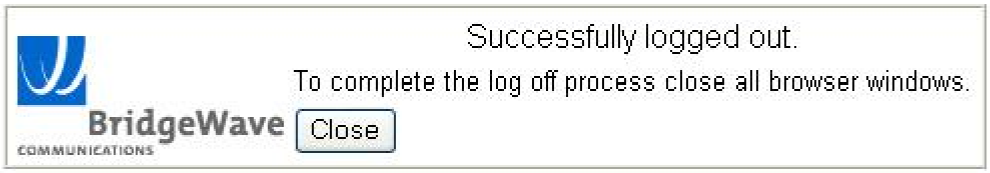
7.6 Logging Out

User connections to the web management agent will automatically log out after 5 minutes (default) of inactivity unless re-configured in the 'Enhanced Security' function. The 'Log Out' option can be used to manually close the User's connection to the management agent. The user will be required to re-enter username and password to regain access to the management agent.

Note	*The automatic log out function will not log out a user connection when the 'Status' or 'Statistics' page is the active page and the 'Automatic Refresh' option is enabled.*

1. Select the 'Log Out' option from the upper right hand corner of the web interface.

2. Select 'Yes' when prompted. This will close the browser window for increased security.



Successfully logged out.

To complete the log off process close all browser windows.

Figure 7-1 User Log Out

8 RADIUS

Remote Authentication Dial In User Service (RADIUS) standard (RFC 2865) allows for remote and centralized user administration, authentication and authorization of the BridgeWave Radio user names and passwords when the radios are embedded in a network environment.

When RADIUS is enabled in the BridgeWave radio and a user attempts to login to the radio, the radio will send the authentication request to the specified RADIUS server.

The communication between the radio and the RADIUS server is authenticated and encrypted through the use of a shared secret. The shared secret is not transmitted over the network.

The radio has three RADIUS configuration options:

- Disable (Default)
- Enable while allowing locally configured (admin, user) login access
- Enable while disallowing locally configured (admin, user) login access

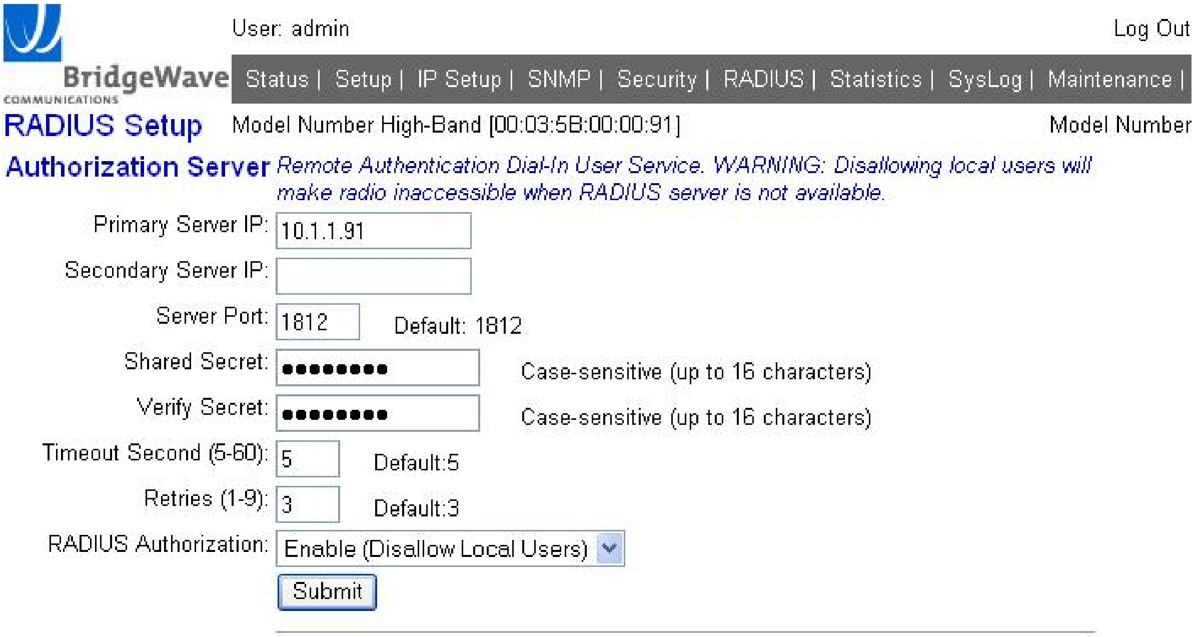
⚠ **Warning**	*If the RADIUS server is not available and RADIUS is enabled with local access disallowed, a hard reset will be needed to regain login access to the radio.*

8.1 Configuring RADIUS

The RADIUS related configuration parameters are located in the RADIUS tab of the web interface.

Use the following steps to configure RADIUS

1. Select the ‘RADIUS’ tab from the web browser interface of the unit.
2. Enter the Primary RADIUS server IP address in the field provided. The Secondary server address is optional.
3. Enter the server port in the field provided
4. Enter the shared secret in the field provided
5. Re-enter the shared secret in the verify field provided
6. Enter the ‘Timeout’ and ‘Retries’ values if other than default is required
7. Select the configuration mode of ‘Disable (Default)’, ‘Enable (allow Local Users)’ or ‘Enable (Disallow Local Users)’ from the drop down menu
8. Push the ‘Submit’ button



User: admin

Log Out

Status | Setup | IP Setup | SNMP | Security | RADIUS | Statistics | SysLog | Maintenance |

RADIUS Setup

Model Number High-Band [00:03:5B:00:00:91]

Model Number

Authorization Server

Remote Authentication Dial-In User Service. WARNING: Disallowing local users will make radio inaccessible when RADIUS server is not available.

Primary Server IP: 10.1.1.91

Secondary Server IP:

Server Port: 1812 Default: 1812

Shared Secret: ●●●●●●●● Case-sensitive (up to 16 characters)

Verify Secret: ●●●●●●●● Case-sensitive (up to 16 characters)

Timeout Second (5-60): 5 Default:5

Retries (1-9): 3 Default:3

RADIUS Authorization: Enable (Disallow Local Users)

Figure 8-1: RADIUS Setup Page

Note	*One possible safe approach to take is to first enable RADIUS and allow local user login access. Now open a new browser window and login with a username and password provided by the RADIUS server. When the login through the RADIUS server is successful, it is safe to re-enable RADIUS in the radio, disallowing local user access.*

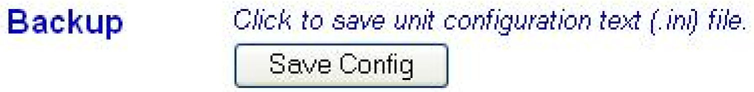
9 Configuration File Management

A copy of the unit's configuration can be saved to an external file. The file is saved in an .ini format and can be viewed with a text editor.

9.1 Backing Up a Configuration

Use the following steps to perform a backup of the unit configuration.

1. Select the 'Maintenance' tab from the web browser interface of the unit.
2. Select the 'Backup' option from the 'Config' section of the 'Maintenance' screen.



3. A File Download window will be displayed. Select the 'Save' option and choose the location and name for the file and then click the 'Save' button. The file will then be stored the chosen location.

9.2 Editing a Configuration File

The configuration radioconf.ini file is text based and various parameters can be edited by using a basic text editor such as Notepad on a windows based PC. The editable parameters in the file are enclosed by quotations "" "". The filename is editable but must remain an .ini file type.

The file is divided into sections with the sections named as follows:

[Header] Do not edit this value; it is used as a file control parameter

[System] The SNMP system name, system description, system contact, system location, session timeout (in seconds), password reuse (yes=1/no=0), and authentication trap (yes=1/no=0) can be edited.

[Trap1], [Trap2] and [Trap3] The three Trap/Syslog IP destinations, names and community information can be edited

[Radauth] The RADIUS Primary and secondary server IP, server port, timeout and retry values can be edited. RADIUS authorization can be disabled (0, default), Enabled and allow local users (1) or Enabled and disallow local users (2)

[Management] The IP address, IP Mask, Gateway, Time-zone, Timeserver The LSP RSL value for RSL activation (lowest RSL) The LSP RSL value for RSL Deactivation (highest RSL), IP address, Access control: In-band (0), Copper Secondary path (1) Copper Out-band (2), AR alignment mode disable on reset (Yes=1/No-0), AR operation mode (1), Fiber auto-negotiation (Yes=1/No=0), AdaptPath/LSP (Enable=1/Disable=0), AES Bypass (1)

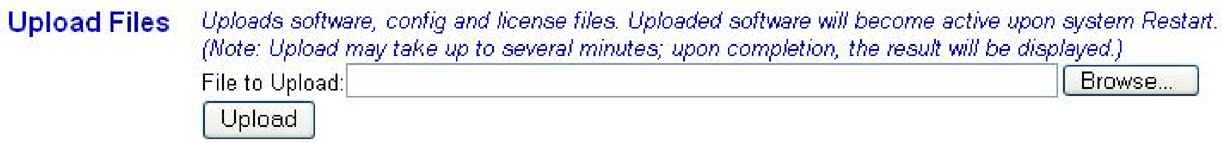
Care should be taken during the editing process to not disturb any other characters other than what is typed between the quotation marks

Care should also be taken when saving the file to keep the .ini extension intact. This is done by selecting “all files as the save type and making sure that the filename has .ini at the end of the filename.

9.3 Restoring a Configuration

Use the following steps to restore the unit configuration from a backup .ini file.

1. Select the ‘Maintenance’ tab from the web browser interface of the unit.
2. Select the ‘Browse‘ option from the ‘Update Software Restore Config’ section of the ‘Maintenance’ screen and select the file from its saved location, then select ‘Upload’.

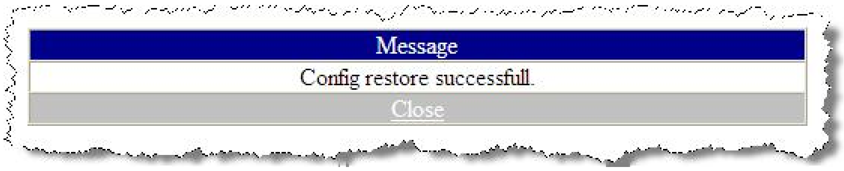


Upload Files

Uploads software, config and license files. Uploaded software will become active upon system Restart. (Note: Upload may take up to several minutes; upon completion, the result will be displayed.)

File to Upload:

The following message will be displayed if successful:



Message

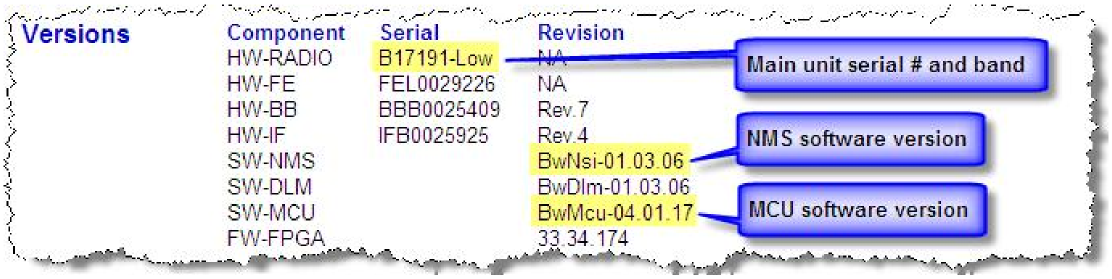
Config restore successfull.

Note	*If IP related parameters were modified in the configuration file it will require a ‘Soft Restart’ before the changes will become active.*

10 Upgrading Software

10.1 Determining Versions

The ‘Versions’ section on the ‘Maintenance’ page of the web interface, shown in Figure 10-1, displays a detailed inventory of a unit’s hardware and software components. The information may be needed when contacting factory personnel to help resolve issues or when updating a unit’s software. The HW-RADIO, SW-NMS, and SW-MCU values can be used to identify the equipment serial number and the two field-upgradeable software components. Prior to performing a software upgrade these three items should be confirmed in order to determine compatibility.



Versions

Component	Serial	Revision
HW-RADIO	B17191-Low	NA
HW-FE	FEL0029226	NA
HW-BB	BBB0025409	Rev.7
HW-IF	IFB0025925	Rev.4
SW-NMS		BwNsi-01.03.06
SW-DLM		BwDlm-01.03.06
SW-MCU		BwMcu-04.01.17
FW-FPGA		33.34.174

Figure 10-1 Hardware and Software Versions

A detailed description of each component is listed below:

HW-Radio: This field displays the serial number of the unit and indicates if it is a High-Band or Low-Band unit.

HW-FE: Displays the serial number of the internal Front End module. *

HW-BB: Displays the serial number of the internal Base Band module. *

HW-IF: Displays the serial number of the internal IF module. *

SW-NMS: Displays the current NMS software version.

SW-DLM: Displays the current DLM software version. *

SW-MCU: Displays the current MCU software version.

FW-FPGA: Displays the current firmware version of the internal FPGA. *

* *Only used by factory personnel*

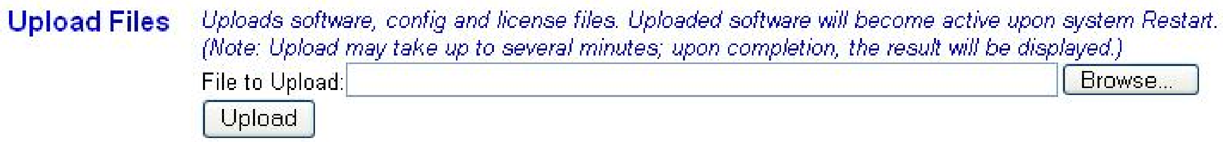
10.2 Software Upgrade Procedure

To obtain the latest version of software, go to the download section of the BridgeWave website at http://www.bridgewave.com/support/downloads.cfm. You will find a list of software updates available for your product. The download consists of a dated .zip file that includes the product software, MIB files and the release notes for the package.
Use the following steps to upgrade a unit's software:

1. Confirm compatibility of your equipment, and current software releases with the available software releases listed on the BridgeWave download site.
2. Download the upgrade package and unzip the files to a known location on your hard drive. Several files will be unzipped into the directory. Some software releases will contain a 'BwNmsSSL-xx-xx-xx.cat' file, a 'MCU_AES-xx-xx-xx.cat' file, or both files, where xx-xx-xx is the version number. When both files are present they must both be upgraded independently starting with the 'BwNmsSSL-xx-xx-xx.cat' file.

Note	*Do not change the .cat extension name, or use the "." character if renaming the file. This will cause the upgrade process fail.*

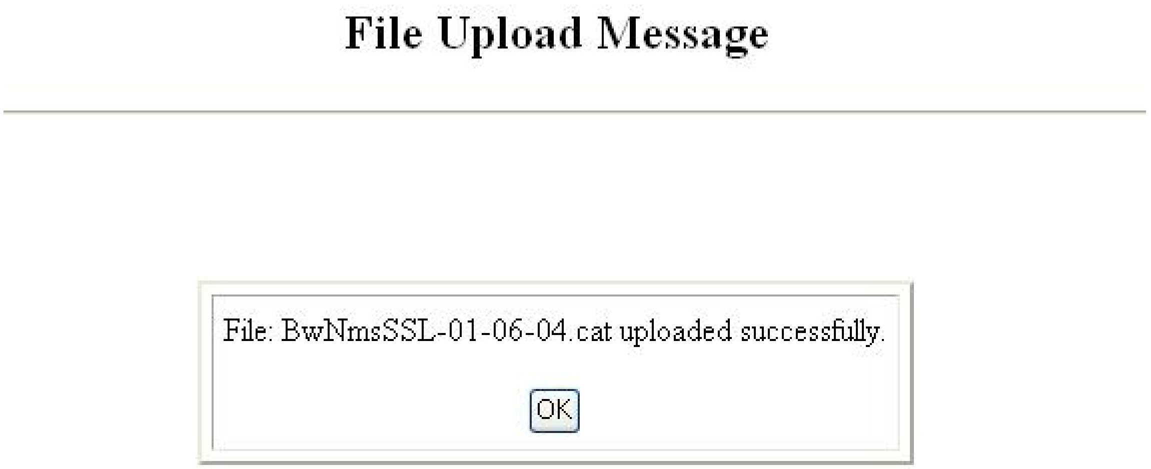
3. Next, browse into the unit that is being upgraded and select the 'Maintenance' tab from the web interface.
4. Select the 'Browse' option from the 'Update Software Restore Config' section and select the new 'BwNmsSSL-xx-xx-xx.cat' file software image from the unzipped file location. Then select 'Upload'.



Upload Files *Uploads software, config and license files. Uploaded software will become active upon system Restart. (Note: Upload may take up to several minutes; upon completion, the result will be displayed.)*

File to Upload:

5. The upload can take several minutes to complete. Upon successful completion a 'File Upload Success' message will be displayed:



File Upload Message

File: BwNmsSSL-01-06-04.cat uploaded successfully.

Figure 10-2 File Upload Success Page

If no indication or a failure message is received after ten minutes, please verify the file name and retry the upload. If the failure repeats, please re-upload the file from the BridgeWave website and retry. If the failure still repeats, please contact customer service.

6. After receiving a ‘File Upload Success’ perform a ‘Soft Restart’ from the ‘Maintenance’ page of the web interface.

⚠ Note	*The management agent will not be accessible for 140 sec after rebooting or Hard Restarting the unit, even though data traffic will flow over the link immediately.*

7. Repeat Steps 3 – 6 for the ‘MCU_AES-xx-xx-xx.cat’ file if it is contained in the .zip release package.

⚠ Warning	*Do not interrupt the upload process when upgrading the ‘MCU_AES-xx-xx-xx.cat’ file. An interruption could cause the unit to become inoperable.*

Note	*When upgrading the MCU_AES-xx-xx-xx.cat file of a remote radio over the wireless interface, the link traffic may drop while the file is being burned to flash. This can cause the 'File Upload Success' message to not be received by the upgrade PC at the local end. If a success message is not received after waiting 15 minutes reconnect to the remote radios web interface and verify the new MCU version is displayed before proceeding with the remaining steps.*

8. After successfully uploading the above file(s) perform a 'Hard Restart' from the 'Maintenance Page' of the web interface, or power cycle the unit.

   The updated software will become active upon completion of the Hard Restart process.

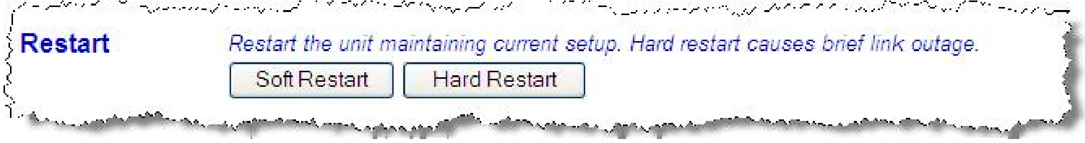
Note	*The management agent will not be accessible for 140 sec after rebooting or Hard Restarting the unit, even though data traffic will flow over the link immediately.*

9. When the web interface becomes available browse into the unit and select the 'Maintenance' tab. Verify that the xx.xx.xx portion of the SW-NMS, and SW-MCU revisions match the xx-xx-xx portion of the 'BwNmsSSL-xx-xx-xx.cat' and 'MCU_AES-xx-xx-xx.cat' files respectively.

10. Next, select the 'Setup' tab. Verify all settings on the 'Setup' page, and select 'Submit Changes', even if no changes were made. This will bind the configuration settings using the logic and functionality contained within the new software. The unit should now be operational with the new software.

11 System Restarts

The following types of restarts can be performed on the unit from the ‘Maintenance’ page of the web management interface:



Restart

Restart the unit maintaining current setup. Hard restart causes brief link outage.

Soft Restart – Performs a soft restart of the unit. This will activate the latest changes submitted from the Setup page. If no changes have been made it will maintain the current configuration settings. A restart will not stop data transfer, but will make the management agent inaccessible for approximately 140 seconds.

Hard Restart – Performs a hard restart of the unit. This will activate the latest changes submitted from the Setup page. If no changes have been made it will maintain the current configuration settings.

⚠ **Warning**	*Performing a ‘Hard Restart’ will momentarily interrupt user data traffic flow across the link.* *‘Soft Restart’ is NOT traffic affecting.*

12 FE-U, AR Trial Mode

The FE80U product is a 100 Mbps Fast Ethernet link that is software upgradeable in the field to Adaptive Rate (AR). The AR feature allows the link to operate in Gigabit Ethernet (1000 Mbps) mode and automatically switch down into Fast Ethernet (100 Mbps) mode during fading conditions caused by rain.

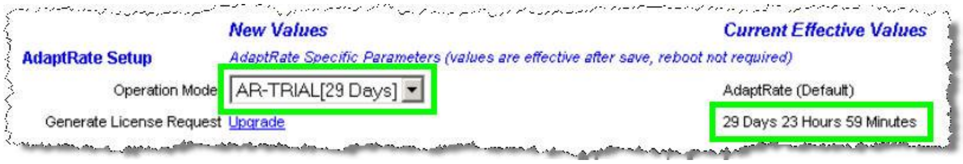
A FE80U comes with an AR demo mode that allows it to be operated as an AR for a period of 30 days once the demo mode is enabled. The link automatically falls back to FE mode when the demo mode has expired. A license file, which unlocks the AR capability, must be purchased to enable products with a "U" designator in the model number to operate in AR mode permanently.

12.1 Enabling AR Trial Mode

Use the following procedure to enable an FE80U or FE60U to operate as an AR80 for a 30-day trial period.

1. Using a web browser connect to the web management interface of the 'High-Band' unit and click on the 'Setup' tab.

2. Under the 'Rate Setup' section toggle the 'Operation Mode' from 100 Mbps to 'AR-Trial and select 'Submit Changes' at the bottom of the screen. After refreshing the browser window a timer will be displayed showing the remaining trial time left. Upon expiration the unit will automatically switch back to 100 Mbps mode.



New Values | Current Effective Values

AdaptRate Setup | AdaptRate Specific Parameters (values are effective after save, reboot not required)

Operation Mode | AR-TRIAL[29 Days] | AdaptRate (Default)

Generate License Request | Upgrade | 29 Days 23 Hours 59 Minutes

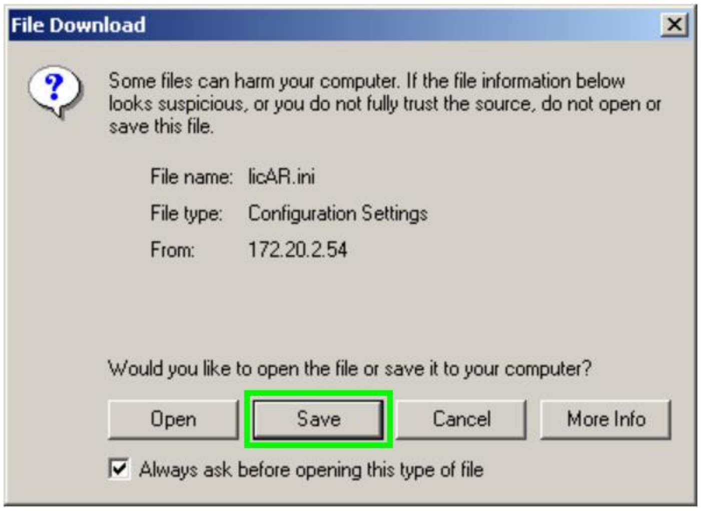
12.2 Upgrading FE-U to AR Mode

The following procedure should be used to permanently add the AR functionality to an FE80U or FE60U link.

1. Using a web browser connect to the web management interface of the 'High-Band' unit and click on the 'Setup' tab.

2. Under the 'Rate Setup' section select 'Upgrade' next to the 'Generate License request' option. A File Download dialog box will be shown.

3. Select the 'Save' option from the File Download dialog box, shown in Figure 12-1 FE-U Upgrade File, and save the 'licAR.ini' file to a known location.



File Download

Some files can harm your computer. If the file information below looks suspicious, or you do not fully trust the source, do not open or save this file.

File name: licAR.ini

File type: Configuration Settings

From: 172.20.2.54

Would you like to open the file or save it to your computer?

☑ Always ask before opening this type of file

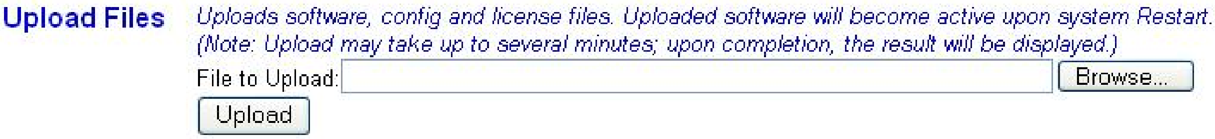
Figure 12-1 FE-U Upgrade File

4. This file must then be emailed to BridgeWave after purchasing an upgrade.

5. Once the upgrade has been purchased, BridgeWave will email a license file that must be uploaded to the High-Band unit. Save this file to a known location.

Note	*The unit's software should not be upgraded until after the license file has been received and properly installed.*

6. From the web interface of the High-Band unit select the 'Maintenance' tab. Under the 'Update Software Restore Config' section select 'Browse' and locate the license file received from BridgeWave, then select 'upload'.



Upload Files

Uploads software, config and license files. Uploaded software will become active upon system Restart. (Note: Upload may take up to several minutes; upon completion, the result will be displayed.)

File to Upload:

7. A confirmation message will be displayed upon successful upload and the unit can then be configured to operate in AR mode from the 'Setup' page.

Contact Sales for more information regarding the purchase of license upgrades.

13 AES Encryption Feature

The Advanced Encryption Standard (AES) feature provides a method for securing the data traffic traveling across the radio link by encrypting the information. The AES feature and the associated procedures in this section only apply to BridgeWave products that include the “-AES” designator in the model number. *Example: AR80X-AES*

In cryptography, AES is a block cipher adopted as an encryption standard by the U.S. government. AES is one of the most popular algorithms used in symmetric key cryptography. The design and strength of all key lengths of the AES algorithm (i.e., 128, 192 and 256) are sufficient to protect classified information up to the SECRET level. TOP SECRET information requires use of either the 192 or 256 key lengths. The BridgeWave AES solution uses the 256 key length.

For the 256 Key, 64, 4-bit HEX characters or 32, 8-bit ASCII keyboard text characters are used for the key.

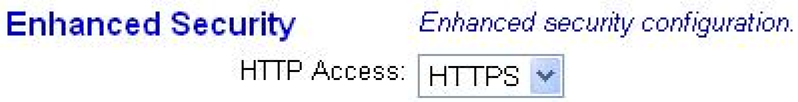
AES product models also support Secure Socket Layer (SSL) connections for enhanced security when accessing the web management interface. The SSL feature requires the “https://” designation be placed in front of the units IP address when trying to access the web management interface.

By default the AES capable units are shipped with AES encryption enabled, with a matching key active on both ends of the link. When encryption is enabled the key must be identically configured on each unit for connectivity across the link to be established.

The Link Quality voltage reading, which is used to determine the performance of the link, is fully functional independent of AES configuration.

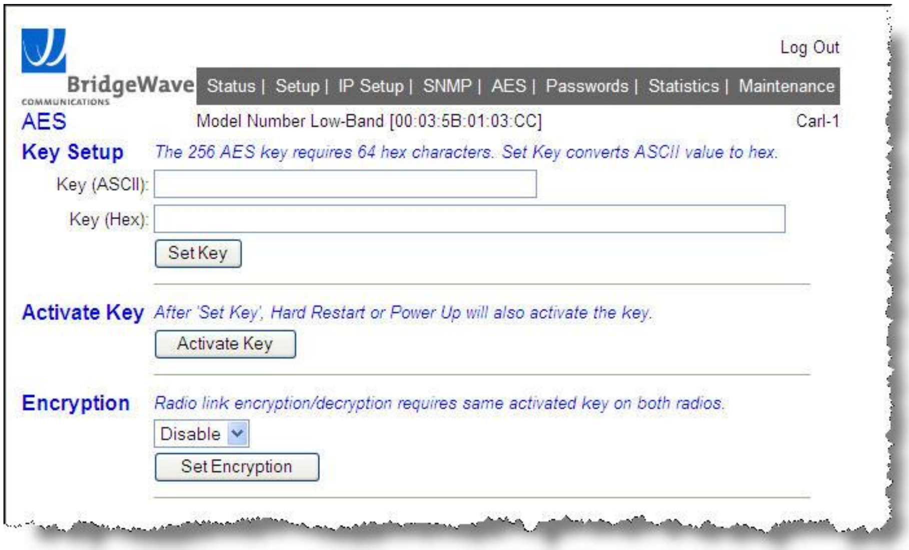
13.1 AES Setup

Use the following procedure to configure and enable AES encryption:

Note	*AES setup requires secure management to be enabled. This can be verified in the 'IP Setup' page as shown:*  **Enhanced Security** *Enhanced security configuration.* HTTP Access: HTTPS

1. AES should only be configured after proper installation has been completed and an unencrypted link has been established and validated. Confirm you are working with a fully operational link.

2. Using a web browser connect to the web management interface of the Local (Near End) unit and click on the 'AES' tab. The 'AES' configuration page shown below will be displayed:


Log Out
Status | Setup | IP Setup | SNMP | AES | Passwords | Statistics | Maintenance

AES

Model Number Low-Band [00:03:5B:01:03:CC]

Carl-1

Key Setup *The 256 AES key requires 64 hex characters. Set Key converts ASCII value to hex.*

Key (ASCII):

Key (Hex):

Activate Key *After 'Set Key', Hard Restart or Power Up will also activate the key.*

Encryption *Radio link encryption/decryption requires same activated key on both radios.*

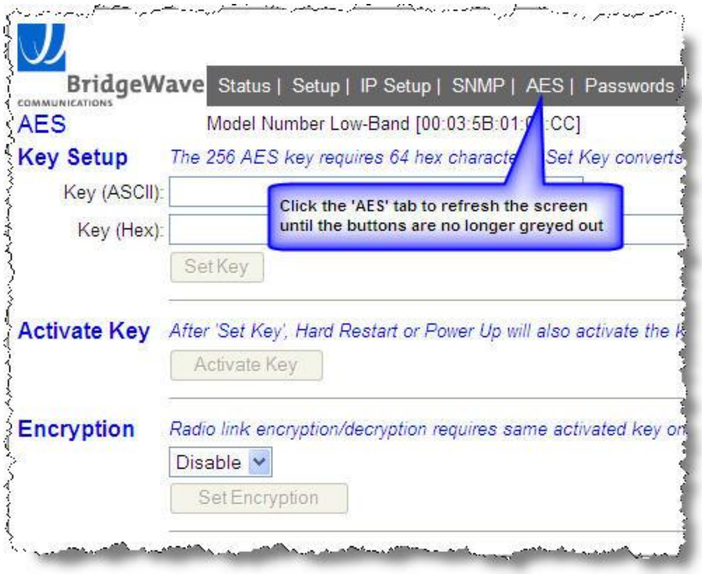
Disable

3. Under the 'Key Setup' section enter up to 32 ASCII text characters into the 'Key (ASCII)' field, and then select the 'Set Key' button. The ASCII characters will automatically be converted to Hex. Alternatively Hex characters can be entered directly into the 'Key (Hex)' field. After 'Set Key' the buttons will become grayed out while the key is being saved to flash. This process can take up to 4 minutes.

Note	*Check the key closely before performing the 'Set Key' operation. The key contents will not be displayed after performing the 'Set Key' operation.*

Note

Click on the 'AES' tab to refresh the page until the buttons are no longer grayed out. Do not hit the browser 'Refresh' option to update the page. This will cause the key to resave and the buttons will continue to be grayed out.


BridgeWave COMMUNICATIONS
Status | Setup | IP Setup | SNMP | AES | Passwords

AES Model Number Low-Band [00:03:5B:01:0 :CC]

Key Setup The 256 AES key requires 64 hex characte Set Key converts

Key (ASCII):

Key (Hex):

Set Key

Click the 'AES' tab to refresh the screen until the buttons are no longer greyed out

Activate Key After 'Set Key', Hard Restart or Power Up will also activate the k

Activate Key

Encryption Radio link encryption/decryption requires same activated key on

Disable

Set Encryption

Please be patient. It may take up to 4 minutes for the 256 key data to be written to the radio memory. The buttons on the AES page will be grayed out during this process.

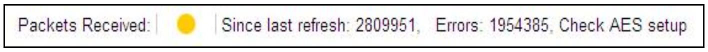
4. Log into the Remote (Far End) unit and perform the 'Set Key' operation outlined in Step 3. Again, it can take up to 4 minutes for the key to be written to the flash memory.

5. Next select the 'Activate Key' option on the Remote (Far End) unit first, and then the Local (Near End) unit. This applies the key to the internal encryption hardware but does not enable encryption.

6. The 'Encryption' field is used to 'Enable' or 'Disable' encryption and is set to 'Enable' by default. Verify that both the Local (Near End) and Remote (Far End) unit 'Encryption' fields are set to 'Enable'. If 'Disable' is selected, toggle the 'Encryption' field of the Remote (Far end) to 'Enable' and then click the 'Set Encryption' button, then perform the same on the Local (Near End) unit.

Note

If connectivity across the link cannot be established after enabling encryption, check the 'Packets Received' field under the 'Radio Interface' section of the 'Status' tab. If errors are displayed followed by the 'Check AES setup' message, shown below, the keys are most likely mismatched and should be reentered into both local and remote units.



Packets Received: ● Since last refresh: 2809951, Errors: 1954385, Check AES setup

14 SysLog

SysLog is a communications protocol as well as program applications used for forwarding, storing and processing log messages in a heterogeneous IP network

SysLog is based on standards RFC 3164 and RFC 3195

The Syslog protocol is a client-server type protocol. The Syslog sender, in this case, the BridgeWave radio, may be enabled to send small textual messages to the Syslog server program.

SysLog is supported across multiple platforms and can be used to integrate data from different types of systems into a central repository.

The BridgeWave radio additionally stores the Syslog messages locally in a circular buffer of up to 256 messages.

14.1 Syslog Message Format

The messages sent to the Syslog server have two fields known as the TAG field and the CONTENTS field.

The values of the TAG field describing the event are SOURCE-SEVERITY-MNEMONIC.

The SOURCE field will contain one of the following: Radio, Fiber, Copper, Equipment, Configuration or Maintenance.

The SEVERITY field will contain one of the following: Emergency (0), Alert (1), Critical (2), Error (3), Warning, (4), Notice (5), Informational (6) or Debug (7)

The MNEMONICS field will contain one or more of the following: RSL, Temp, Input Voltage, Error, LSP, TX, Calibration, Upload, Laser, Status or Start

The CONTENT is delimited by a colon and contains the details of the message.

Some sample Syslog messages to the Syslog server are as follows:

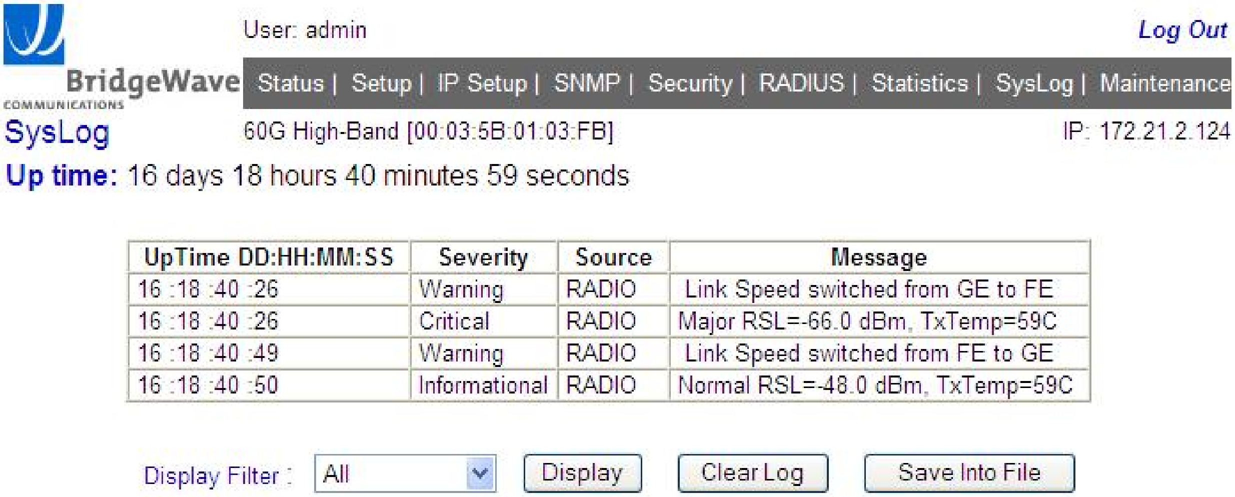
FIBER-2-STATUS:Link Down	(indicates critical status that fiber link is down)
FIBER-6-STATUS:Link Up	(indicates informational status that fiber link is up)

Radio-2-STATUS:Link Down RSL=-46 dBm, TX Temp=39C (Indicates a critical status, the RF in the link is down, the RSL and transmitter temperature when it went down)

14.2 Local Syslog Message Display

As shown in Figure 14-1, Local Syslog Message display, 'Up Time, 'Severity', 'Source' and 'Message' information is presented for the operator.

The 'Save Into File" button transfers the SysLog data to an Excel file


BridgeWave
COMMUNICATIONS
Log Out
Status | Setup | IP Setup | SNMP | Security | RADIUS | Statistics | SysLog | Maintenance
SysLog
Display Filter :
Display
Clear Log
Save Into File

User: admin

60G High-Band [00:03:5B:01:03:FB]

IP: 172.21.2.124

Up time: 16 days 18 hours 40 minutes 59 seconds

UpTime DD:HH:MM:SS	Severity	Source	Message
16 :18 :40 :26	Warning	RADIO	Link Speed switched from GE to FE
16 :18 :40 :26	Critical	RADIO	Major RSL=-66.0 dBm, TxTemp=59C
16 :18 :40 :49	Warning	RADIO	Link Speed switched from FE to GE
16 :18 :40 :50	Informational	RADIO	Normal RSL=-48.0 dBm, TxTemp=59C

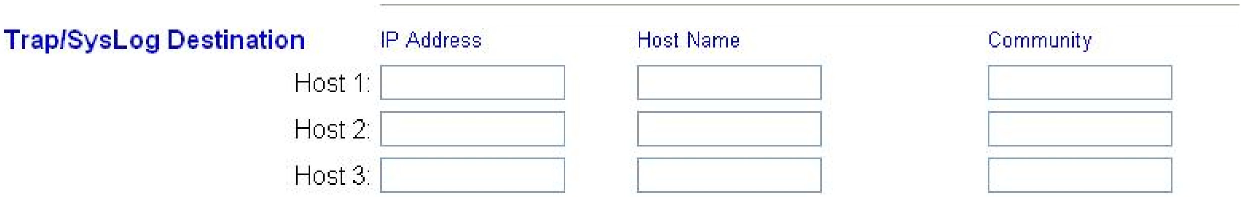
Display Filter : All

Figure 14-1, Local Syslog Message display

14.3 Syslog Setup

The Syslog server destination is setup on the SNMP page as follows:

1. Select the SNMP tab from the web browser interface of the unit
2. Enter the IP address of the Syslog message destination in the IP address field of Host 1, Host 2 or Host 3 fields. The Host name and Community are not needed.



	IP Address	Host Name	Community
Host 1:			
Host 2:			
Host 3:			

15 Default Recovery (Hard Reset)

If the unit's Administrator password or IP configuration is forgotten, it will be necessary to perform a hard reset to return these parameters to the factory default values. Only the Administrator/User/Factory passwords, IP configuration, and Management Access parameters will be reset to default values. All other parameters will remain in their currently configured state.

Each BridgeWave unit is shipped with a hard reset box that can be used to return the unit to its default factory configuration.
In order to reset the Administrator password and IP configuration, it is required to have physical access to the unit's copper data port (RJ-45 jack) or cable and the unit's power cable.

⚠ Warning	*User data traversing the radio link will be briefly interrupted during the hard restart process.*

Procedure

1. First power down the unit,

2. Connect the hard reset box via a straight-through (standard) Ethernet cable at least 3 meters long to the copper (RJ45) port on the unit. If a cable is already running to the RJ-45 port of the unit, the reset box can simply be connected to the other end of this cable.

3. Reconnect power to the unit and **wait a minimum of 90 seconds,** before disconnecting the hard reset box. The unit will then begin its normal restart cycle, and the management agent will normally become accessible within approximately **3** minutes using the default IP configuration, usernames, passwords and community strings.

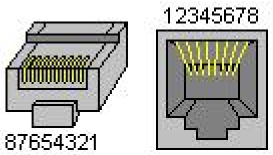
Note	*This may take longer than the normal 140 seconds for the restart operation to complete and the management agent to become available.*

Making your own hard reset cable:

If you do not have access to the hard reset box supplied with the unit, you can create your own "hard reset cable" using the following procedure:

1. Obtain a standard Ethernet patch cable at least 3m in length.

2. Cut off one end of the Ethernet patch cable and then strip the jacket from the two wires that belong to pins 3 and 6. These are typically the wires from either the orange/white-orange or green/white-green pairs, but this is not guaranteed to be the case.



3. Connect the two wires from pins 3 and 6 together to make a short. All other wires must be left un-terminated.

4. Use this hard reset cable as a substitute for the hard reset box and Ethernet cable. Instead of disconnecting the hard reset box (as in the previous procedure), disconnect the wires going to pins 3 and 6 from each other and leave the cable in place for the additional 2 minutes; it is important not to remove the cable from the unit until the process is complete.

(End of NMS manual, this page intentionally left blank)